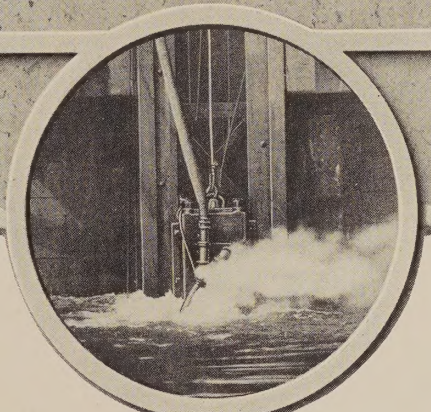
McKiernan-Terry Pile Hammers

McKiernan-Terry

DOUBLE-ACTING

Pile Hammers



—for all kinds of pile driving and pile pulling
—from the heaviest to the lightest

Catalog No. 40

McKIERNAN-TERRY CORPORATION
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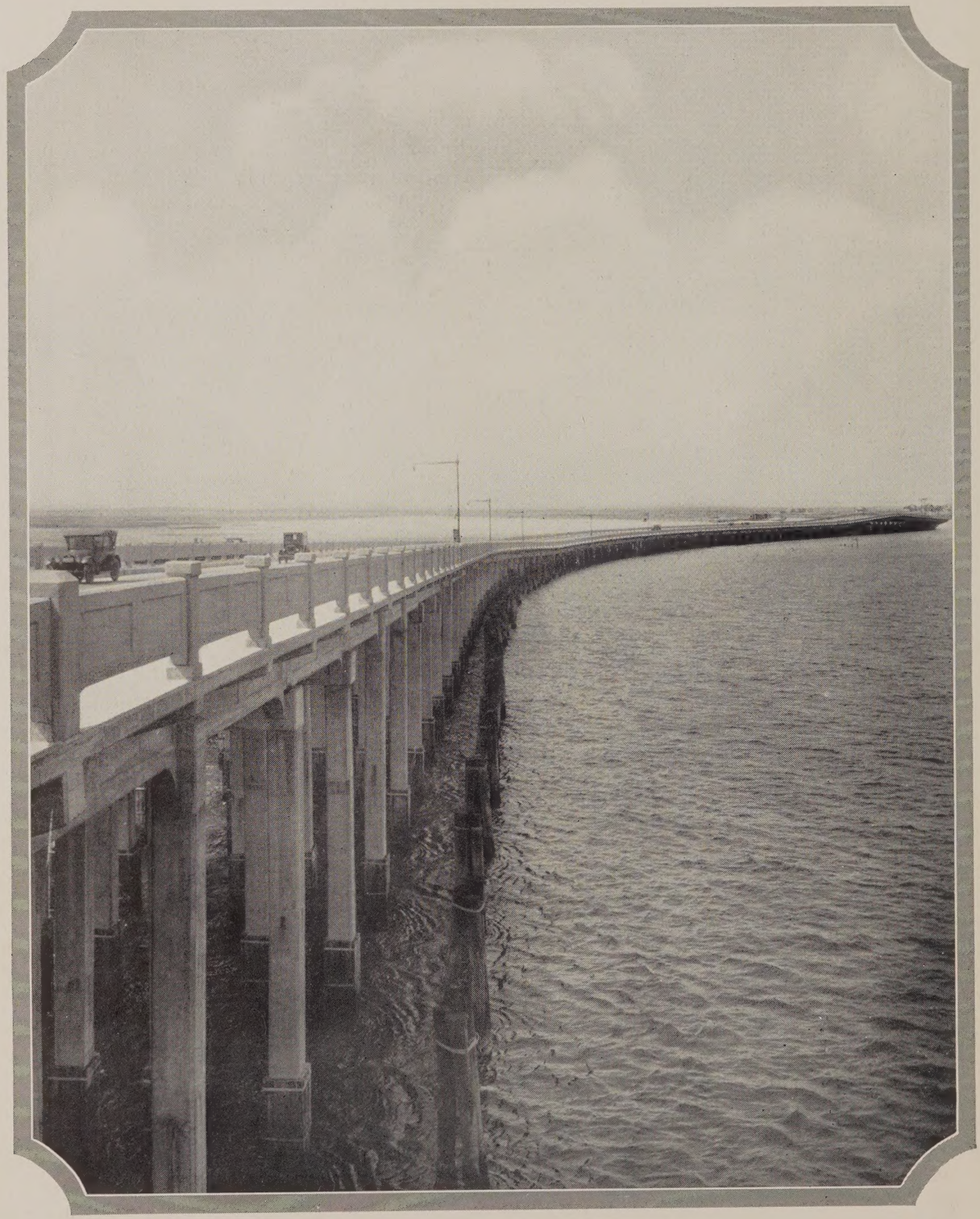


Jamaica Bay Causeway, from Howard Beach, Queens, to Rockaway, New York.
Typical of the big pile-driving projects handled with McKiernan-Terry Pile Hammers.

Introductory

McKIERNAN-TERRY Pile Hammers have always been pioneers. First came the McKiernan-Terry double-action principle—a most important development in pile-driving practice. Next the double-duty feature—*driving* and *pulling* with the same McKiernan-Terry Hammer. Then the Type B Heavy-Duty Pile Hammers were developed and contractors quickly realized that they need no longer depend upon the slow, ponderous, unwieldy drop hammer for the heavier kinds of pile driving. The next important McKiernan-Terry development was the Subaqueous Pile Hammer—the driving of piling under water, sometimes with the hammer submerged to depths of 80 feet or more below the surface. The fifth and latest development is the use of McKiernan-Terry Hammers for demolition—breaking up reinforced concrete structures, heavy masonry and concrete pavements.

Some of these developments of McKiernan-Terry Pile Hammers were brought about largely as a result of the ingenuity of various leading contractors, cooperating with McKiernan-Terry Engineers. As a matter of policy, this Corporation has always endeavored to keep in close touch with users of pile hammers, with a view of helping to make the hammers most profitable to their owners and watching for new methods which can be passed on to other users of McKiernan-Terry Pile Hammers in various parts of the world. In this way there has been developed a tendency on the part of McKiernan-Terry users to keep the Corporation informed as to new and important projects and methods of handling them.

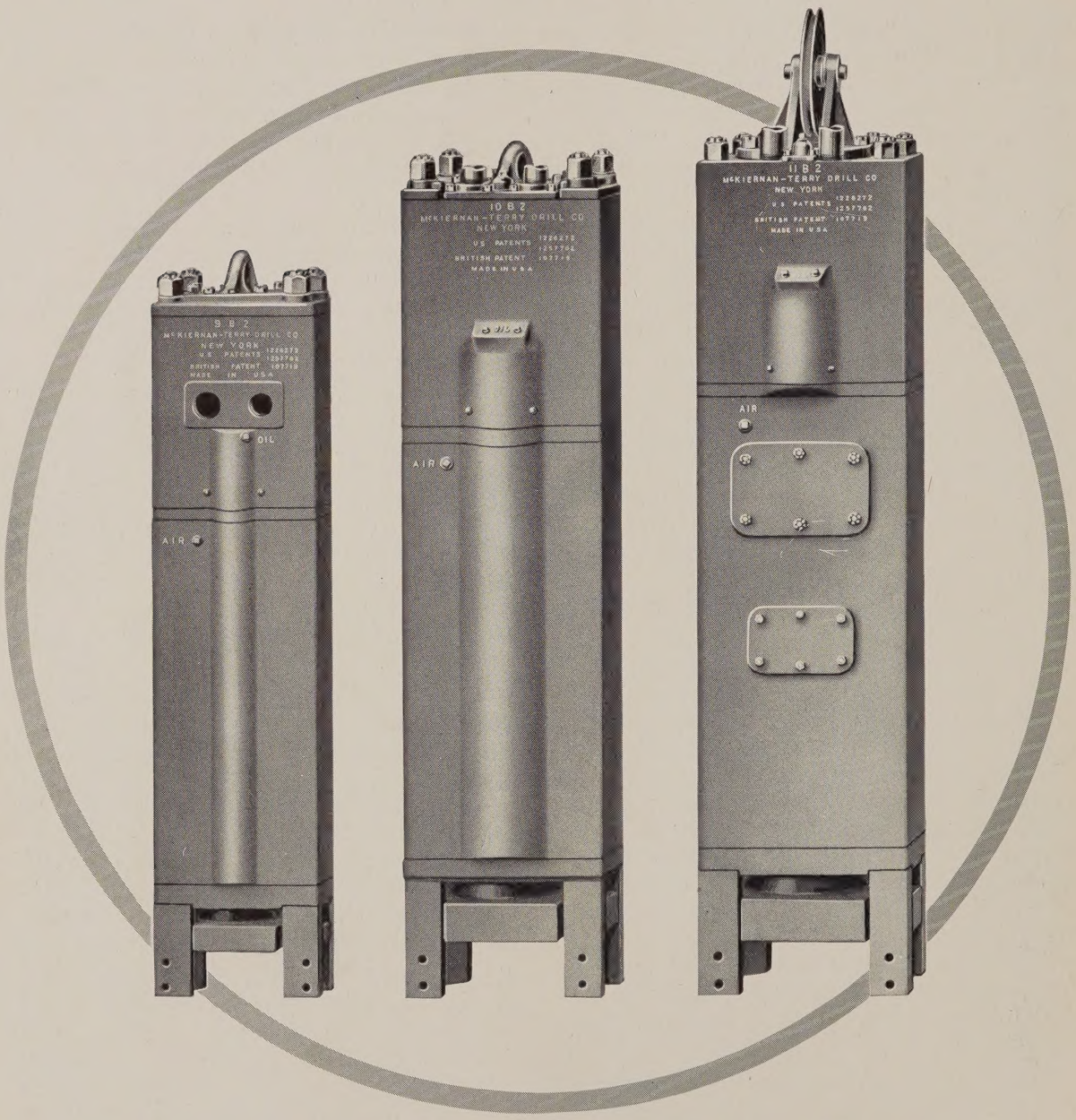
The results of all this experience throughout the world are made available to all users of McKiernan-Terry Equipment. The trade publications also are very alert and interested in new developments, and much space is devoted every year to the description of pile-driving operations in which McKiernan-Terry Hammers have played a leading part. Thus engineers all over the world not only benefit by the experiences of others but also contribute their share to the fund of available data.

Present-day heavy pile driving requires sturdier hammers than ever before. It has been a matter of pride with the McKiernan-Terry Corporation to improve the construction of its hammers to keep pace with the increasing demands upon them. The best proof that this aim has been realized is the fact that even on the heaviest work of today, McKiernan-Terry Pile Hammers cause less trouble than was experienced years ago on much lighter work. Further proof of the excellence of McKiernan-Terry Construction is found in the wide use of McKiernan-Terry Pile Hammers in practically every country on earth. Even in the most distant lands, far removed from sources of repair parts or expert mechanics, McKiernan-Terry Pile Hammers are being used with great success and profit.

From the contractor's standpoint, dependable operation of pile hammers is most important. Labor and other costs are so high, and it is usually so important that the pile driving be finished on schedule so that other work can be started, that dependable service is far more important than the first cost of the hammer.

McKiernan-Terry Pile Hammers are treated in this book in three groups—the Type B Heavy-Duty Hammers (Nos. 9-B-2, 10-B-2 and 11-B-2), which are also the Subaqueous Hammers, beginning on the next page; the Medium Weight Pile Hammers, Nos. 5, 6 and 7, beginning on page 54; and the Light Labor-Savers, Nos. 0, 1, 2 and 3, beginning on page 84.

McKiernan-Terry Type B Heavy-Duty Pile Hammers

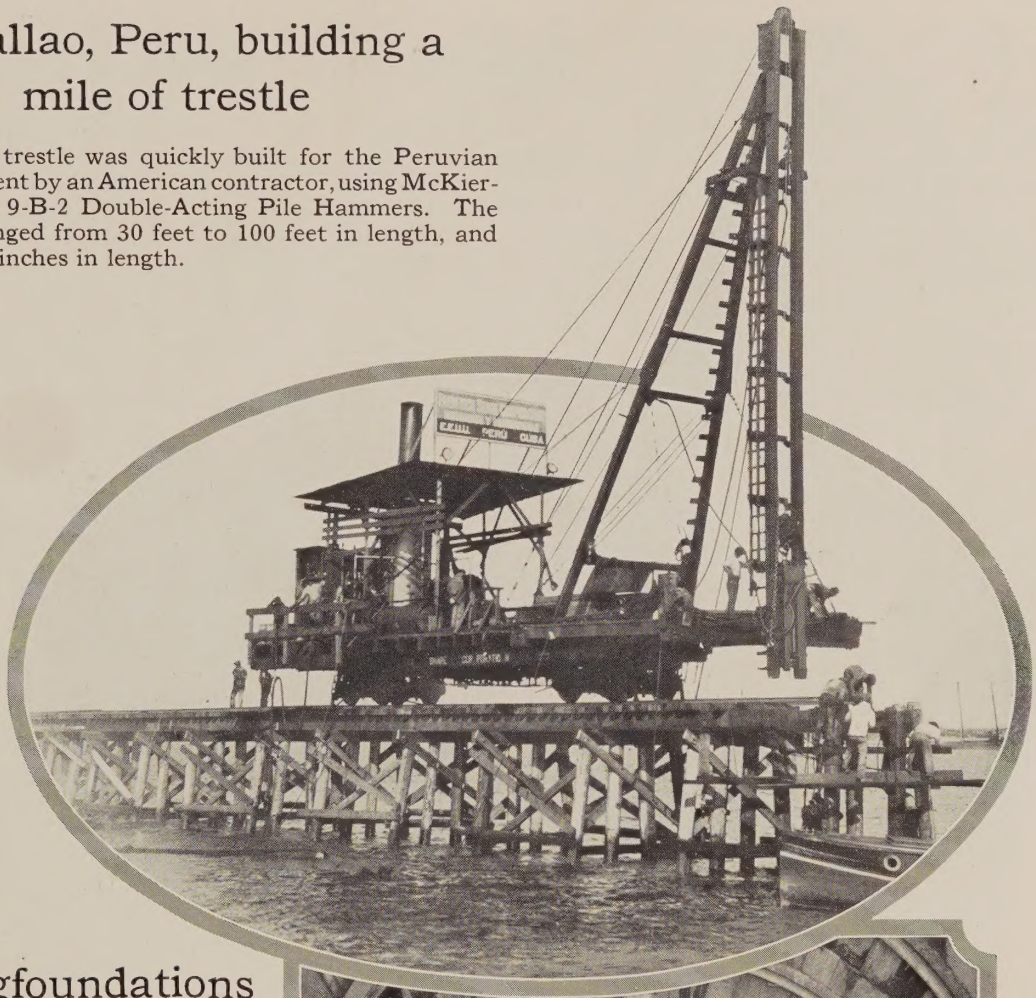


Weights

No. 9-B-2, 6,760 lb.
No. 10-B-2, 10,000 lb.
No. 11-B-2, 13,185 lb.

At Callao, Peru, building a mile of trestle

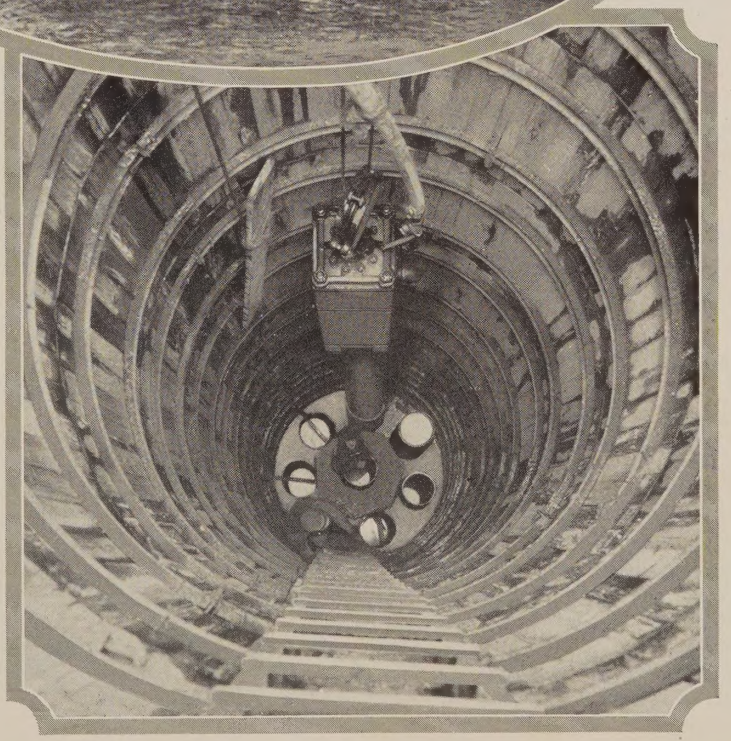
A MILE of trestle was quickly built for the Peruvian Government by an American contractor, using McKiernan-Terry No. 9-B-2 Double-Acting Pile Hammers. The piles driven ranged from 30 feet to 100 feet in length, and leads 45 feet 6 inches in length.



Buildingfoundations of the Ambassador Bridge

A DETROIT contractor used McKiernan-Terry No. 9-B-2 Pile Hammers to drive eight 18-inch diameter steel tubes, 55 feet long, in the bottom of each of six 60-foot deep caissons, which were 8 feet 3 inches in diameter, for the American approach foundations of the Ambassador Bridge across the Detroit River. The tubes were driven down to rock, to less than 1-inch penetration under 100 blows of the hammers.

The Ambassador International Bridge is a privately owned highway toll structure between Detroit, Mich., and Sandwich, Ont. It has a main span of 1850 feet with towers 380 feet above mean water level. Two cables 18¾ inches in diameter support the main span.



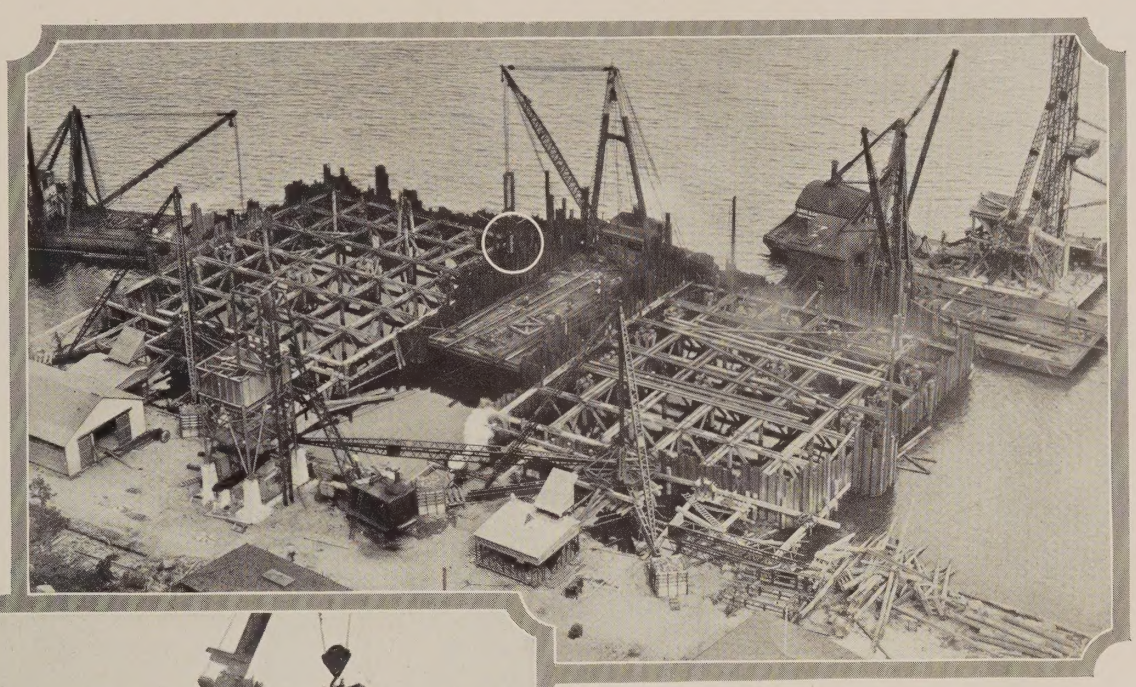
Driving heavy concrete sheeting

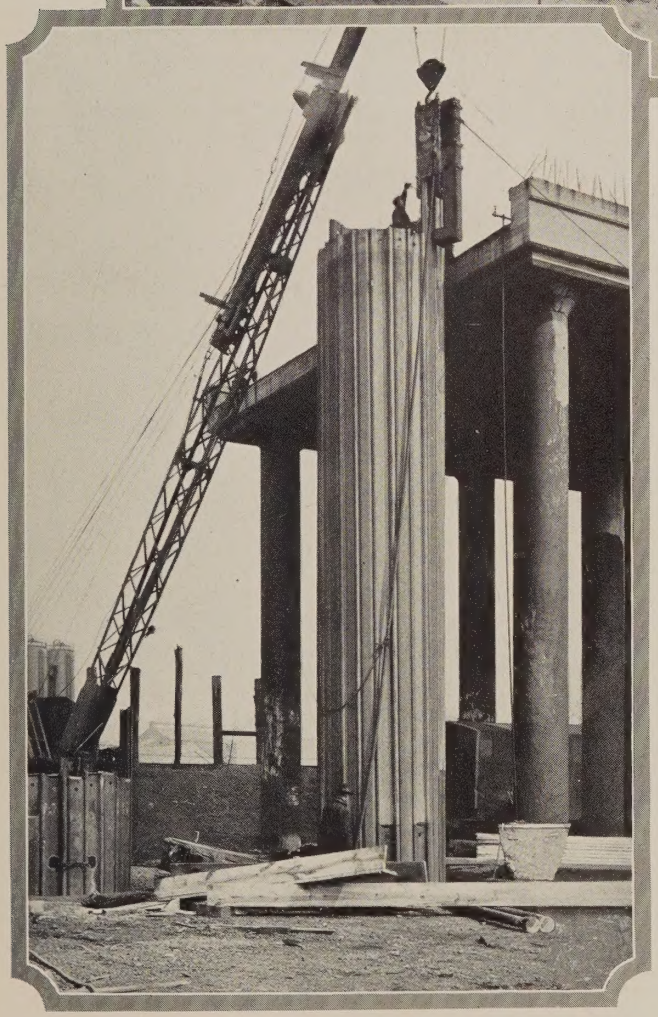
McKIERNAN-TERRY Type B Pile Hammer driving 20-inch square *tongue and groove concrete sheeting* 48 feet long for the extension of Flatbush Avenue across Jamaica Bay, L.I., to Barren Island, a part of the vast Jamaica Bay reclamation project being executed by the City of New York.

The driving was through hard fine sand and clay strata of varying thickness. Where this picture was taken the clay strata overlying the sand was 27 feet thick, necessitating hard driving throughout the 38 feet of penetration, jetting being of very little assistance.

One thousand concrete sheet piles and eight hundred 54-foot semi-octagonal concrete bearing piles, 16 inches in diameter, were driven on this job.

The picture in the oval shows the unique method employed by the contractor for driving the heavy concrete sheet piles with minimum damage to the piles. The timber follower was tied up into the recess in the pile hammer anvil block and was fitted with guides to ride on the leaders of the pile driver ways. It had a renewable wooden driving block at the lower end, which set easily in between the reinforcing rods, squarely in the center of the tops of the piles, thereby providing protection for the reinforcement, concentrating the blow at the point of maximum density and strength of the pile, and eliminating spalling off of the concrete around the edges.





1600 Tons of sheeting on Fort Lee Bridge job

IN the construction of the two New Jersey pier cofferdams on the Fort Lee Bridge, crossing the Hudson River at New York, a total of 1600 tons of steel sheet piling 45 to 85 feet in length was driven with McKiernan-Terry Pile Hammers.

The site of the cofferdams was dredged over and the actual penetration required to reach rock was 20 to 25 feet. It took the contractor only one month to set up and drive the sheeting using a No. 6 and two No. 9-B-2 pile hammers. Each of the cofferdams were 98 feet 5 inches by 108 feet 11 inches, one section being of the cellular design.

For other views of this job see page 80.

On railroad bridge construction

ON the Lackawanna Railroad Bridge across the Hackensack River, Kearny, New Jersey, the contractor drove down cylinders composed of 14-inch by ½-inch steel sheet piling, with McKiernan-Terry No. 9-B-2 Pile Hammers. The piling was in two sections spliced to make an unimpaired length of 85 feet and was driven to bedrock practically its full length.

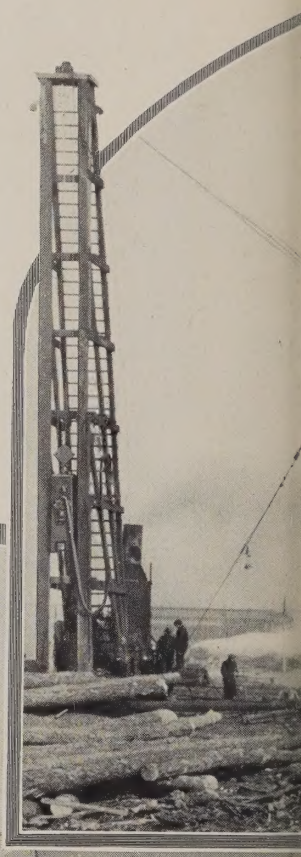
McKiernan-Terry Pile Hammers driving 38,000 piles

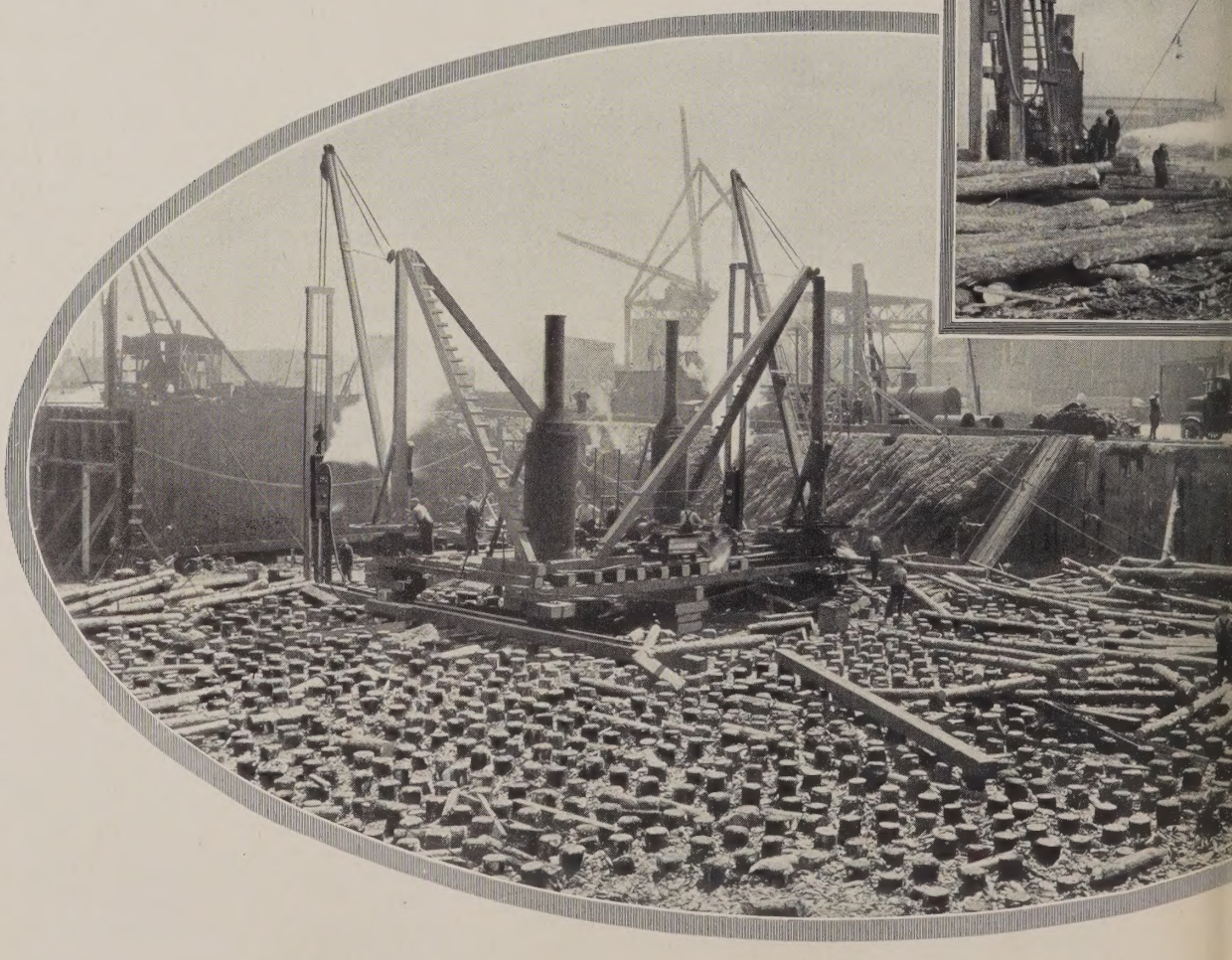
THE building of the foundations, in bogland, for the new plant of the Western Electric Company, in Kearny, New Jersey, required the driving of some 38,000 timber piles. For driving these piles four steam pile drivers with McKiernan-Terry Pile Hammers were used. These were lined up about 40 feet apart as shown in the picture.

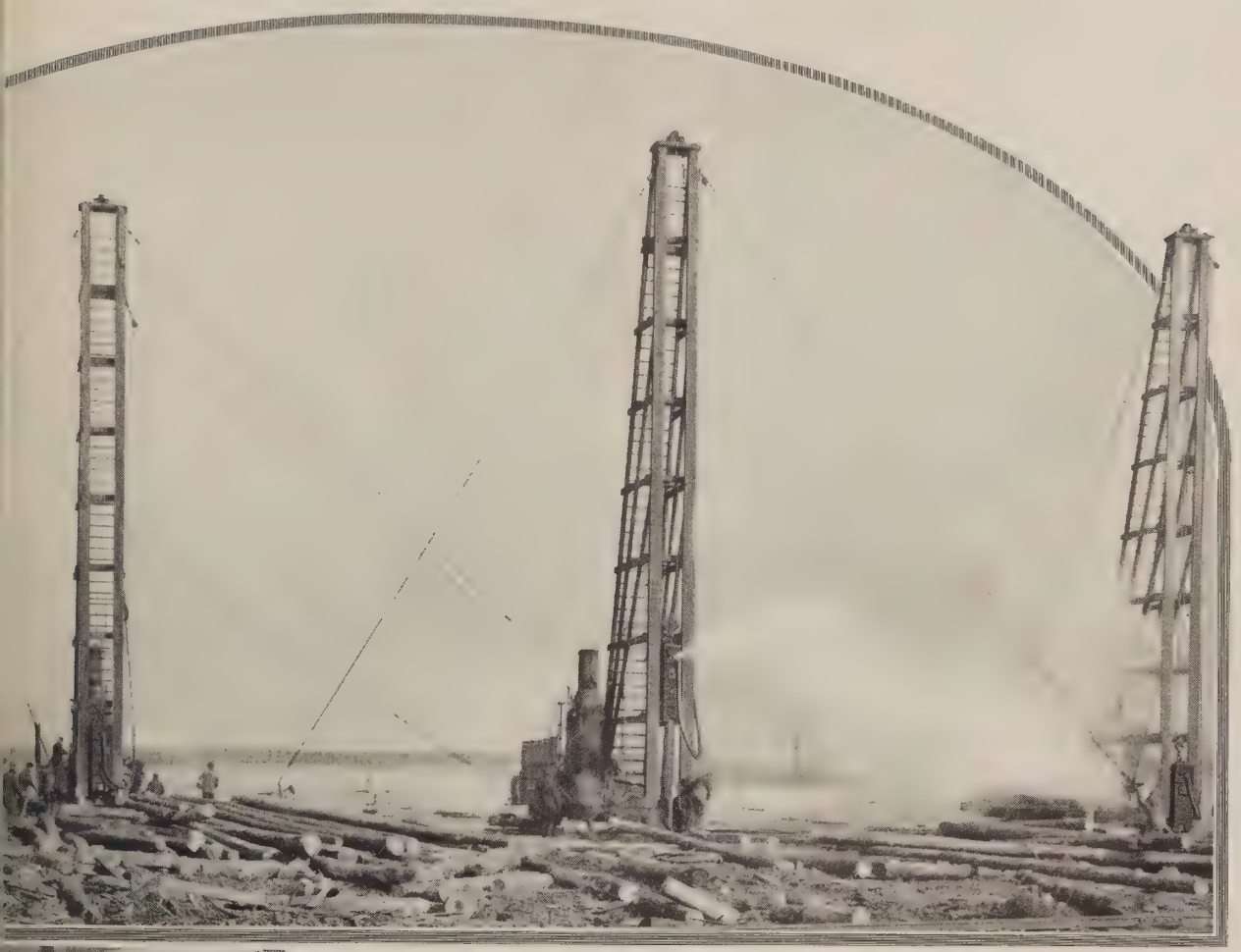
With the four pile drivers as many as 275 piles were driven in a single day. To add to the difficulty it was found that the underlying stratum of clay and sand was very undulating, in some cases as close to the surface as 15 feet, while 50 feet away it would be 40 feet deep. Each pile driven was a test pile for the next one.

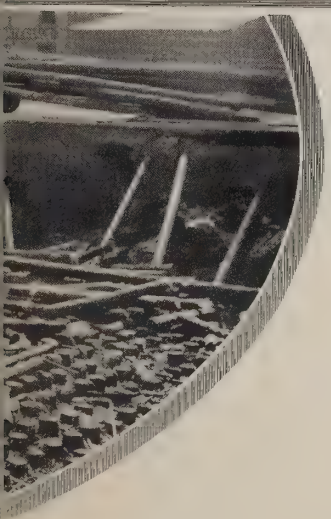
It was no unusual sight to see one machine driving piles 15 to 20 feet long and the one adjacent 40 to 45 feet long.

For another picture showing subaqueous hammers working on the same job see page 46. Later work on an addition to the plant is shown on page 22.









18,000 Piles—250 per 8-hour day driven with five McKiernan-Terry Hammers

FIVE McKiernan-Terry Type B Pile Hammers were used here for driving 18,000 wood piles, spaced 2½ feet center to center in an area covering two city blocks.

This work was on the foundation of the $30,000,000 plant of the New York Edison Company at 14th Street and East River, New York. The piles averaged 30-foot penetration, the majority with points from 8 to 11 inches in diameter and butts up to 16 inches, the driving was in a dense mixture of coarse sand and clay.

The McKiernan-Terry Type B Hammers were operated in two travelers with swinging leads, each operating two hammers and one land rig operating one hammer.

The contractor on this job writes, "We have easily been maintaining fifty piles per 8-hour day per hammer."

McKiernan-Terry Pile Hammers on these large construction jobs speed up the work and save costs for both contractor and owner.

Driving tapered concrete bearing piles

IN the construction of the foundation of the Howard Bend Water Works plant, Hine, Mo., built for the city of St. Louis, a number of McKiernan-Terry Pile Hammers were used for driving concrete piles and sheeting. Here a McKiernan-Terry No. 9-B-2 Pile Hammer is driving 25-foot tapered concrete piles, 14-inch butt, to full penetration. This hammer was suspended in swinging leads hung from a shovel boom. These piles were driven without any indication of spalling or cracking.

Besides the No. 9-B-2 Hammer there were also No. 6 and No. 7 McKiernan-Terry Pile Hammers for driving sheeting and subaqueous piles. The McKiernan-Terry Pile Hammers gave excellent service on this work. Other pictures of the same job are shown on pages 49, 50 and 51.

Driving large concrete piles in Japan

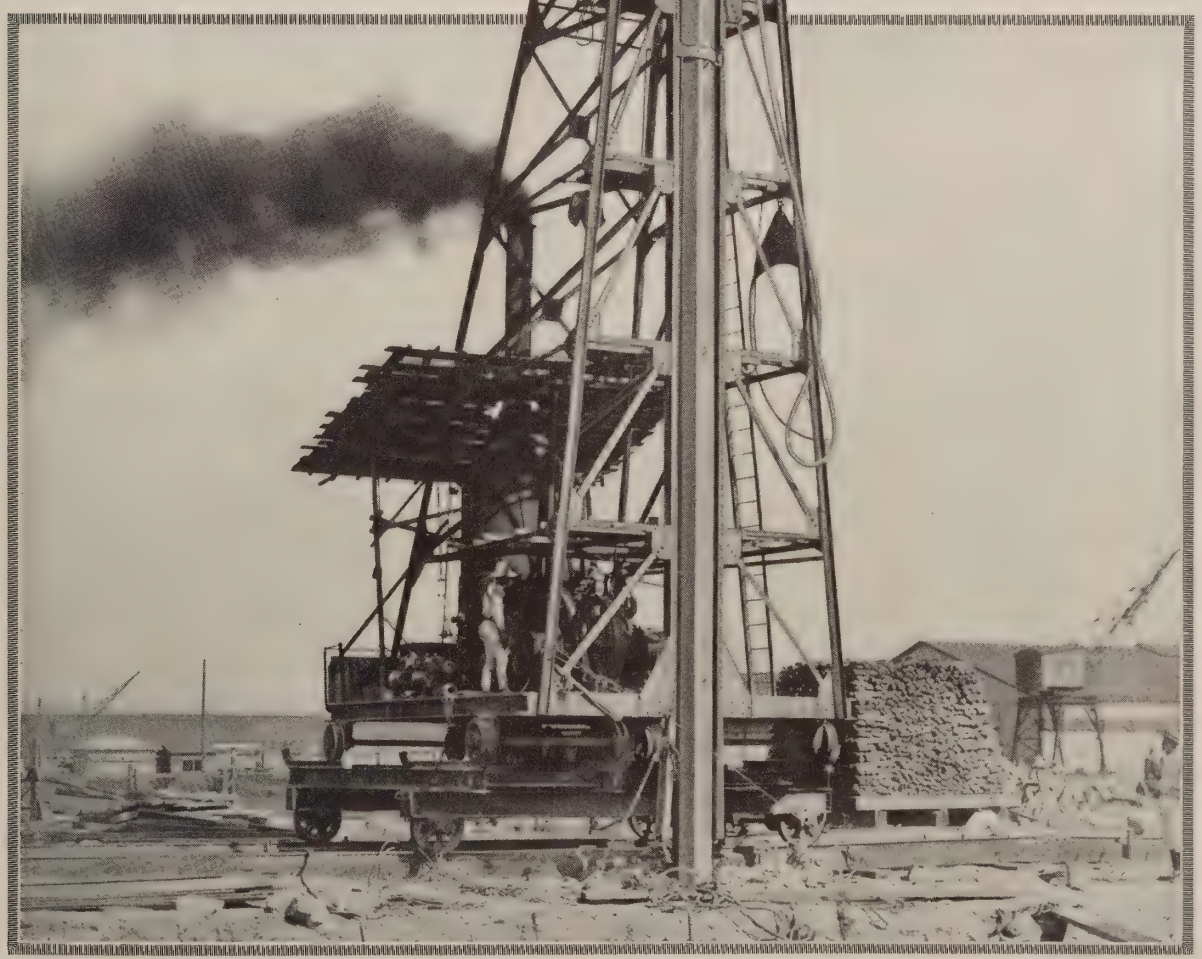
THIS picture shows a Type B McKiernan-Terry Pile Hammer being used on foundation work in Kobe, Japan, for driving concrete piles.

These piles were reinforced concrete 18 inches square and 40 feet long.

Large numbers of McKiernan-Terry Pile Hammers are shipped each year for large construction jobs all over the world.

Using native labor almost entirely, most of whom are unfamiliar with machinery, and being so far away from replacements, pile hammers used in the foreign field must have that standup ability which is characteristic of McKiernan-Terry Double-Acting Pile Hammers.

Contractors have confidence in McKiernan-Terry Hammers and know that their use will speed up the work.



Thirty-four hammers on one job in India

THIS picture shows one of twelve pile-driving outfits furnished for the Government of India by the British Steel Piling Company of London, foreign representatives for the McKiernan-Terry Corporation.

Thirty-four McKiernan-Terry Pile Hammers are included in this equipment—ten No. 7, nine No. 9, and fifteen No. 9-B-2.

Three more of these complete equipments will eventually be supplied for this job, the construction of the Lloyd Barrage at Sukkur Sind.

The pile hammers are suspended in pendulum leads swinging from the runways between the heads of the frames.

Driving batter piles economically

THIS work was on one of twelve 1000-foot piers built on Staten Island, New York. McKiernan-Terry Pile Hammers were used on nine of the piers and two of the hammers were rigged as shown for driving batter or brace piles.

This rigging makes a pile hammer frame unnecessary and enables the contractor to drive piling readily in inaccessible places where it would be impossible to use either a floating pile driver or an ordinary land rig.

The 4-foot pipe sleeve (see close-up illustration in the oval) is bolted to the inside of the jaws of the hammer, making a guide for the pile and holding it in place while driving.

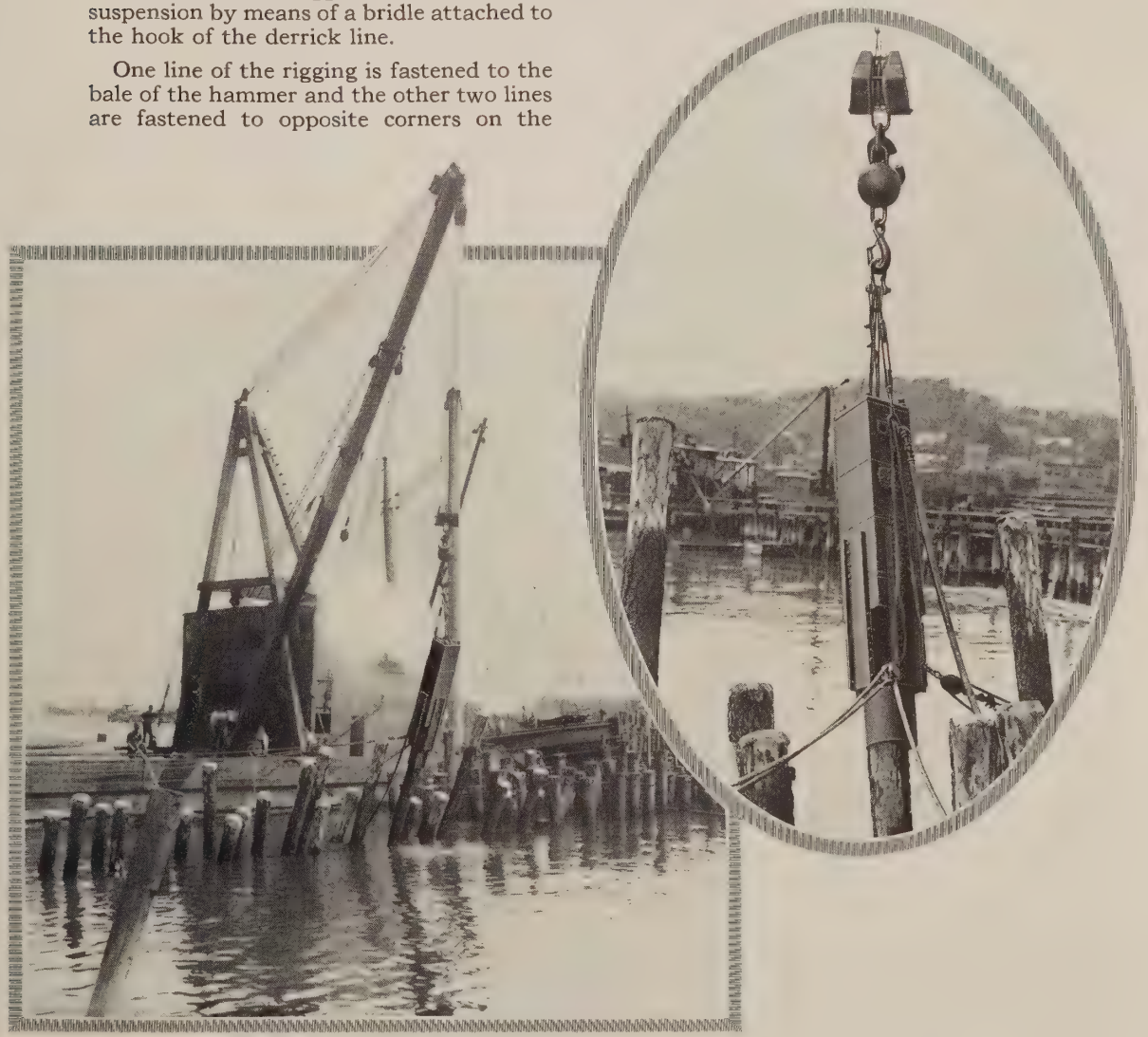
The hammer is rigged on a three-point suspension by means of a bridle attached to the hook of the derrick line.

One line of the rigging is fastened to the bale of the hammer and the other two lines are fastened to opposite corners on the lower end of the hammer and terminate in a heavy turnbuckle which in turn is secured to the derrick hook.

Thus the hammer hangs at a fixed angle and this angle can be changed as desired by means of the turnbuckle.

The city inspector in charge stated that the McKiernan-Terry Hammers with this unique rigging drove two piles to every one driven with drop hammers in batter leads. Over 2000 piles were driven with one of these McKiernan-Terry Pile Hammers.

In one 8-hour day 92 long batter piles were driven—one every five minutes.



Driving 15-inch pipe piles to rock

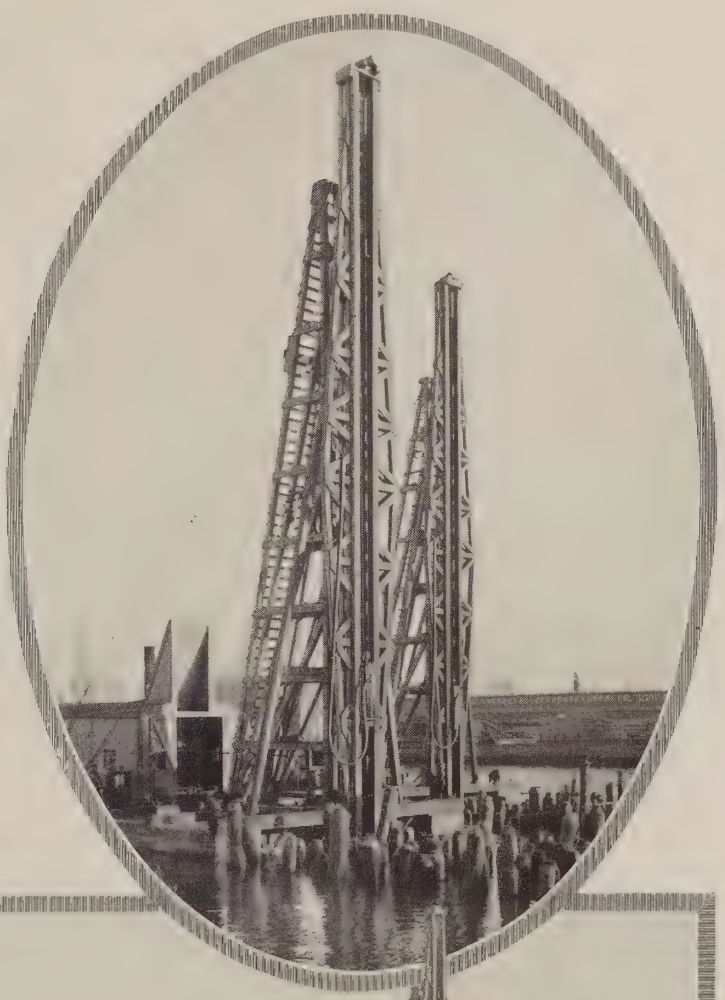
IN this picture a No. 9-B-2 McKiernan-Terry Pile Hammer is being used to drive 15-inch steel pipe piles for the foundation of a New York loft building. These pipe piles were driven to rock, cleaned out with compressed air, and then filled with reinforced concrete, in the usual way. The piles were driven in clusters for the pier foundation. This type of work has come into very general use and the Type B McKiernan-Terry Pile Hammers are especially suitable for it.

McKiernan-Terry Pile Hammers drive pipe piles without battering the tops.

9200 Big timber piles on this pier job

THE pictures show work on Erie Railroad Pier No. 9, Jersey City, New Jersey. The pier is built on a concrete substructure, resting on timber flooring supported by Douglas fir and long leaf yellow pine piles, in lengths from 82 to 120 feet.

McKiernan-Terry No. 9-B-2 Hammers were used. In one day (8 hours) one driver placed 75 piles, spotting them 14 inches from the side of the under-river tunnel. Pile heads were driven to 2 feet below water. Specially constructed leads developed maximum efficiency. Pendulum leads, 100 feet; main leads, 80 feet. The pile butts were 17 to 21 inches. Penetration, 60 to 85 feet. Average driving for two pile hammers, 80 piles per 8 hours.



Driving heaviest steel piling sections

THE work here was on the Welland Canal, Ontario, Canada. The Pile Hammer shown is driving 75-foot lengths of steel sheet piling for a cofferdam, through a very stiff clay bottom. This was one of a series of cellular cofferdams, the inner and crosswalls being built of the heaviest sections of steel sheet piling.

These cofferdams were used in the construction of a syphon for carrying a river under the canal.

McKiernan-Terry Pile Hammers will drive steel sheet piling without battering the tops.

McKiernan-Terry Pile Hammers driving open-end pipe piles

ON foundation jobs, such as this, McKiernan-Terry Pile Hammers save money for the contractor. This particular work was the foundation for a large department store built in Newark, New Jersey. During its construction 50,000 lineal feet of 16-inch open-end steel pipe piles were driven by McKiernan-Terry Type B and No. 7 Pile Hammers.

These pipe piles were driven 65 feet below the street level. On this job, as on all cylinder jobs, including the largest, McKiernan-Terrys gave a good account of themselves.

Wherever McKiernan-Terry Pile Hammers have been used for heavy foundation jobs such as this, contractors find that the work has always been done at the least possible cost.

For subaqueous driving and for pile pulling, McKiernan-Terry Hammers again save profits for the contractor.

McKiernan-Terry No. 9-B-2 driving piles through a roof

IN the construction of a new flooring foundation for Pier No. 21, Erie Railroad, New York, a McKiernan-Terry No. 9-B-2 Pile Hammer was used to drive 80-foot timber piles through the roof because the pier shed could not be moved. About 100 piles were driven to an average penetration of 40 to 45 feet with this McKiernan-Terry Pile Hammer swung from a 112-foot extension boom.

Driving 52-inch diameter cylinders with No. 9-B-2 Pile Hammer

DURING the building of the foundations of The Bank of The Manhattan Company Building, New York, the contractor operated McKiernan-Terry Hammers by air to drive large-diameter cylinders through sand and hardpan to 32-foot penetration.

These 52-inch diameter cylinders, with $\frac{5}{8}$-inch thick walls, were driven by a McKiernan-Terry No. 9-B-2 Pile Hammer acting at the center of a steel girder placed across the top of the cylinder.

These cylinders were driven to rock and then filled with reinforced concrete.

Other pictures of this job are shown on pages 58 and 59.

Driving 61 large cylinders in Oklahoma City

McKIERNAN-TERRY No. 9-B-2 Pile Hammers were again successfully used for driving large-diameter cylinders on the new Montgomery Ward Building in Oklahoma City, Oklahoma, shown in the lower picture.

Sixty-one open-end steel cylinders, ranging from 6 to 8 feet in diameter, were driven to their full length through 30 feet of sand and clay.

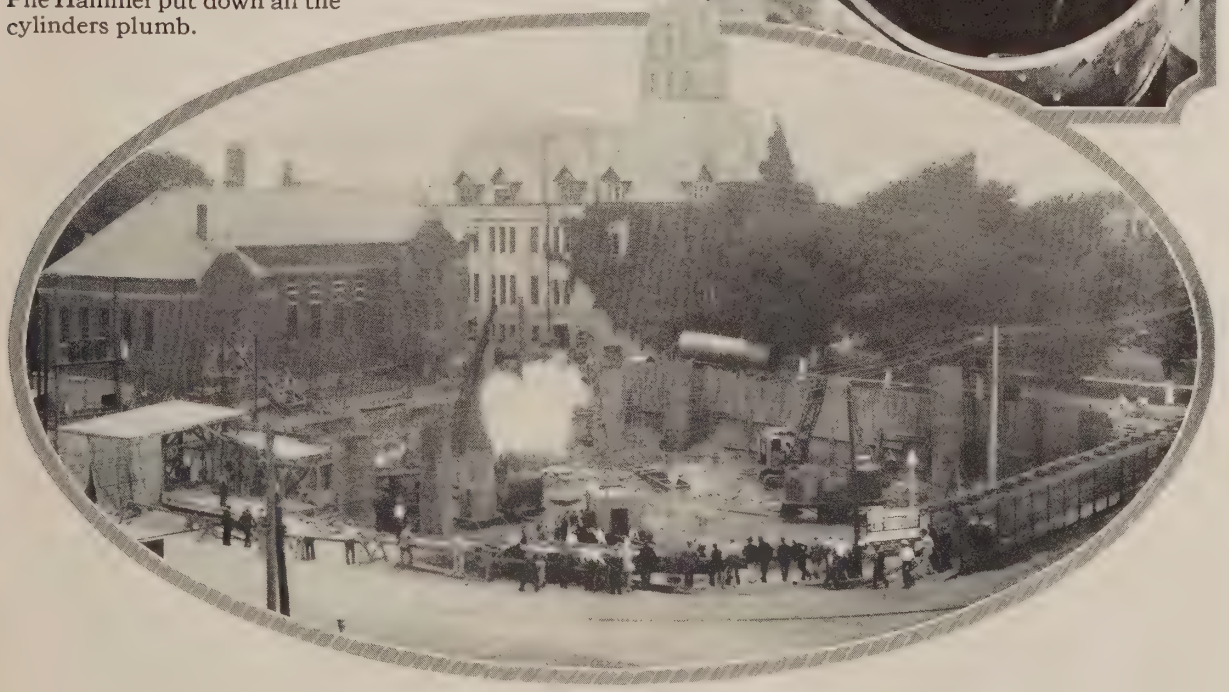
These cylinders were driven in an excavation 17 feet below the street level. When driven to rock, the bottom of each cylinder was 47 feet below the curb.

On several cylinders the hammers were assisted by weighting the cylinders down. Across the top of the cylinder a cradle built of I-beams and two cylinder sections filled with concrete. The driving was done on top of the I-beams.

Another job with driven cylinders

FOR the foundation of the new addition of the Museum of Natural History, in New York, the contractor used McKiernan-Terry Pile Hammers to drive the steel cylinders.

The work consisted of driving a large number of open-end cylinders, 42 to 68 inches in diameter, in 10-foot lengths one on top of the other. The cylinders were driven to rock, penetrating soil from 20 to 54 feet. In one instance, rock penetration was 2 feet. Driving on a 14-inch H-column, the McKiernan-Terry No. 9-B-2 Pile Hammer put down all the cylinders plumb.



Steel sheeting driven into rock

THE picture at the right shows one of three McKiernan-Terry Type B Pile Hammers driving steel sheeting for a 500-foot bulkhead for the wharf of the United Railways, Havana, Cuba.

On part of the work the steel piling was driven into coral rock to a depth of 2 feet, and in other places a channel was drilled in the rock and the steel sheet piling driven therein to a depth of 14 feet.

Steel sheeting in hard beach sand

ABOUT 60 circular cofferdams, 60 inches in diameter, were driven with this McKiernan-Terry Type B Pile Hammer (lower picture), for the foundation of a grain elevator at the Barge Canal Terminal, Oswego, New York.

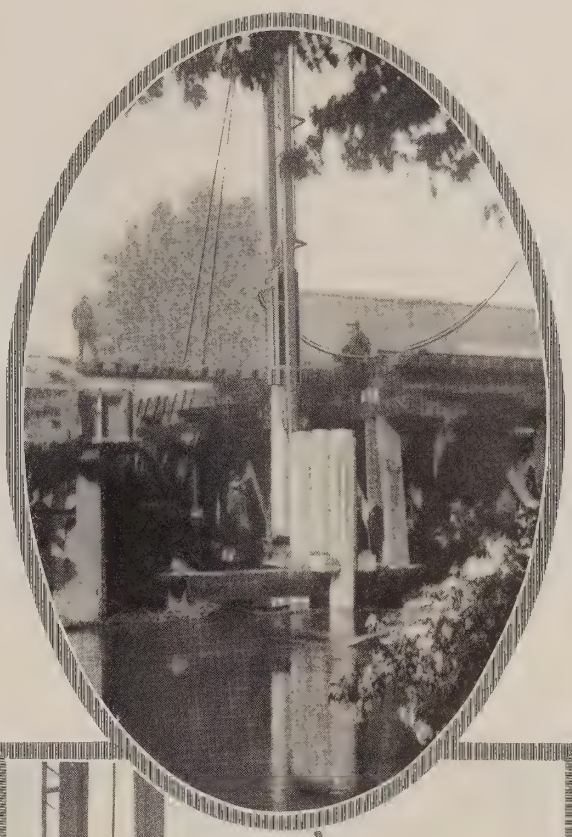
The sheet piles were 44 feet long and were driven to bed rock (42 feet penetration).

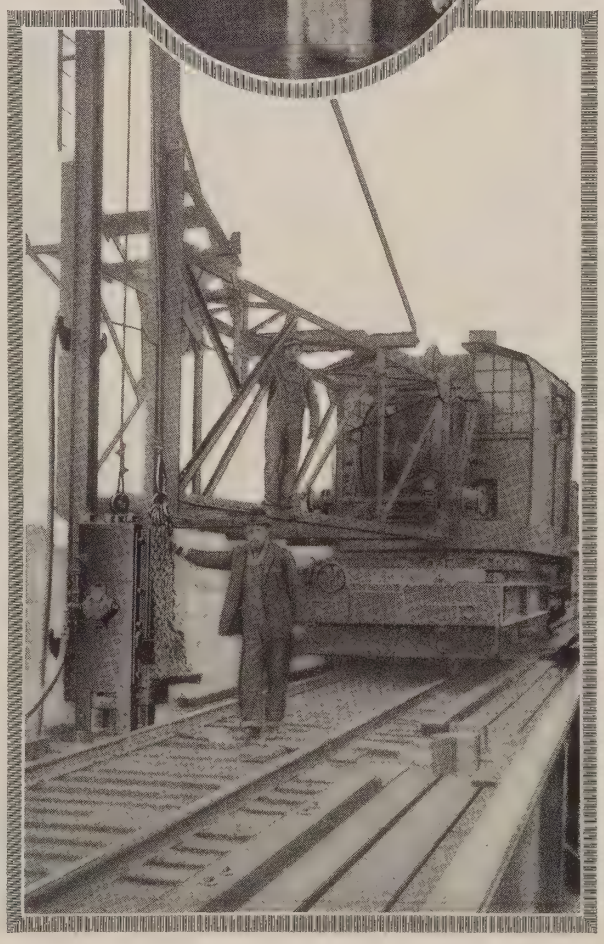
The hammer was rigged out from a timber mast set up in the center of the cylinder and was revolved as the driving advanced. The work was difficult, as the formation was the exceedingly hard beach sand found in the region of Lake Ontario. After the concreting was finished, McKiernan-Terry No. 6 and No. 7 Pile Hammers were inverted and used to pull the sheeting. See illustration under "Pile Pulling," page 79.

Typical McKiernan-Terry Railway Pile Drivers

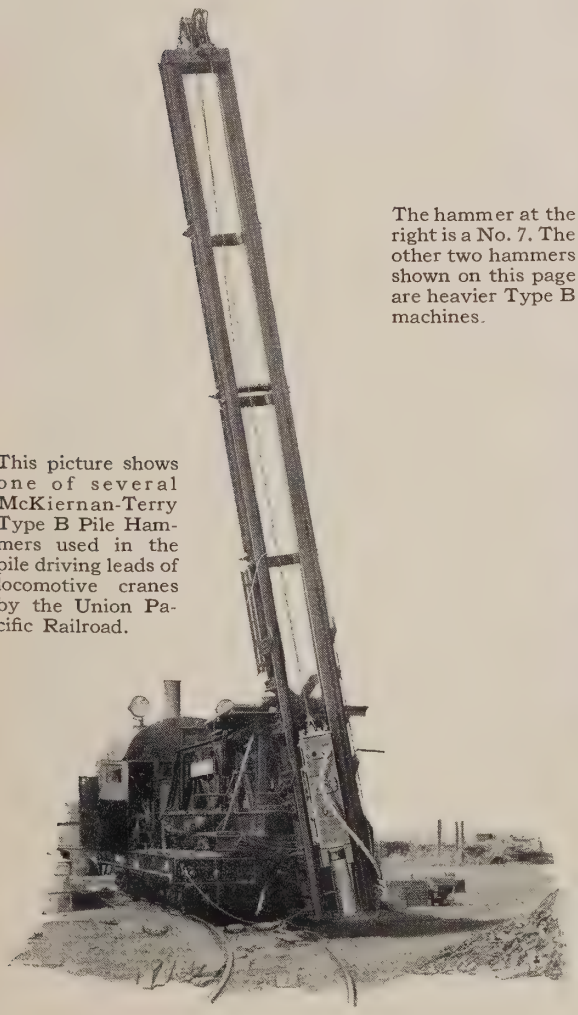
IN the upper oval picture is a No. 9-B-2 McKiernan-Terry Pile Hammer driving 18-inch octagonal reinforced concrete bearing piles for a bridge on the Pennsylvania Railroad.

Below at the right is a No. 7 McKiernan-Terry Hammer in the leads of a locomotive pile driver used by the Elgin & Joliet Railway. This Hammer is used without any special base arrangement for driving both sheeting and round timber piles. It is supported by the boom of a locomotive crane and is often used for driving between ties, also for driving sheeting under bridges and trestles, where headroom is limited.

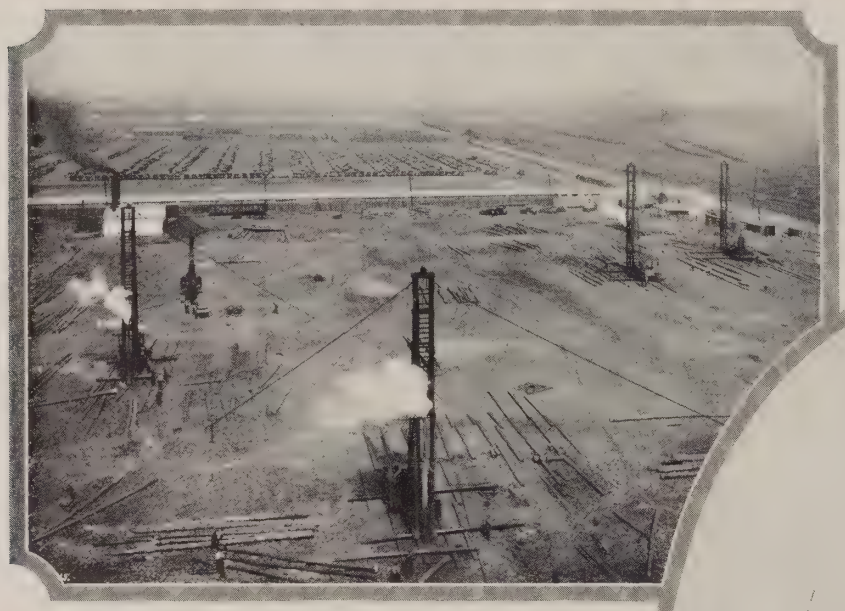




The hammer at the right is a No. 7. The other two hammers shown on this page are heavier Type B machines.



This picture shows one of several McKiernan-Terry Type B Pile Hammers used in the pile driving leads of locomotive cranes by the Union Pacific Railroad.



9200 Piles driven on this job

ON a new addition to the plant of the Western Electric Company, Kearny, New Jersey, the contractor drove 9200 piles with McKiernan-Terry Pile Hammers, to 36-feet average penetration. The piles, 35 to 40 feet in length, were driven through 6 to 7 feet of coarse sand and river mud and 10 to 12 feet beyond this into stiff clay.

The No. 9-B-2 drove a daily average of 20 piles per day and the No. 10-B-2 put down 30 to 35 piles daily.

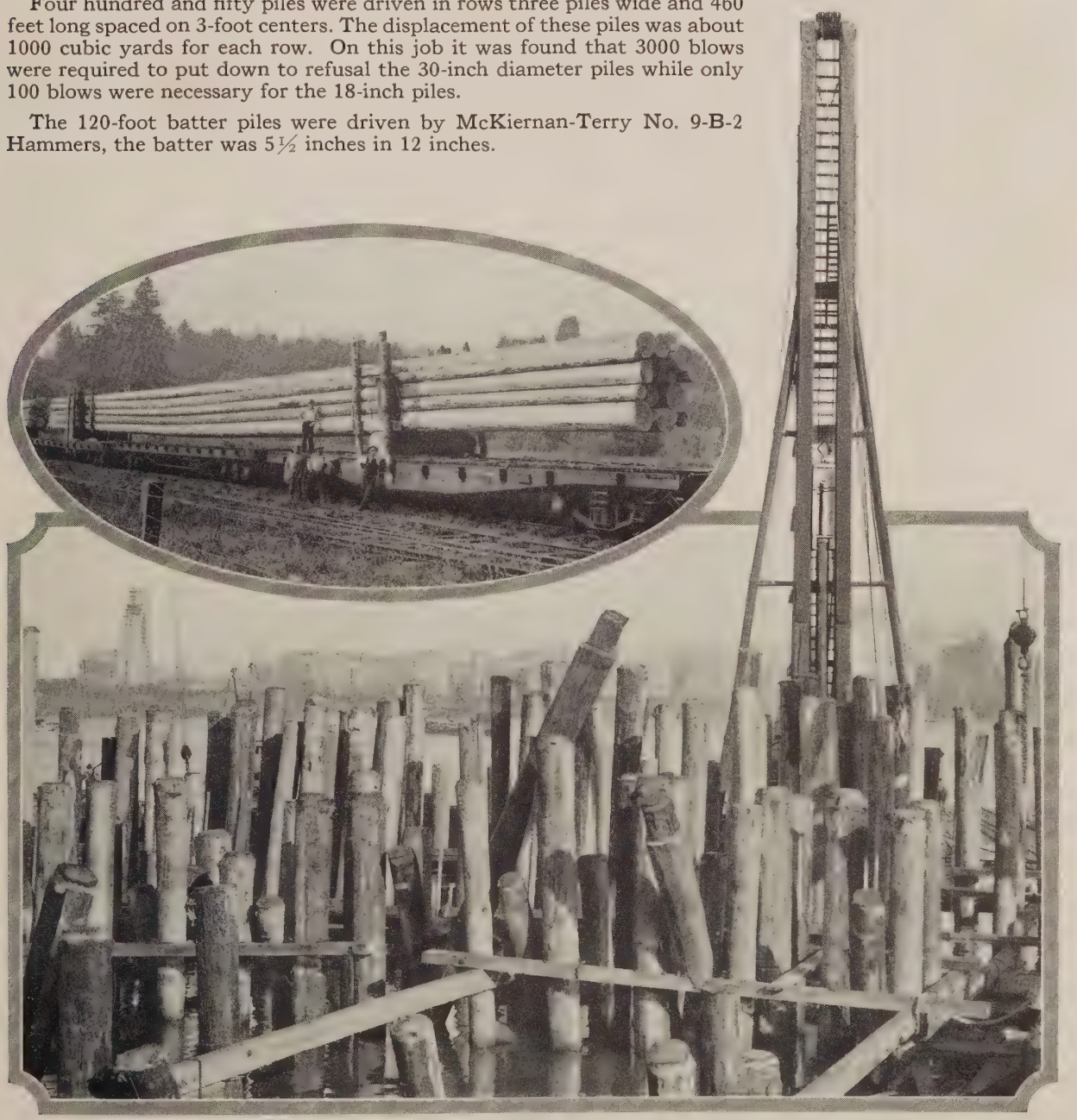
A few years previous 38,000 piles were driven here by McKiernan-Terry Pile Hammers. This job being an extension of that work. See Pages 8, 9 and 46.

Successfully driving 120-foot timber piles

DURING the construction of the foundations for the new assembly plant of the Ford Motor Company in Edgewater, N.J., the contractor found that 6000-pound drop hammers were too slow so they used several McKiernan-Terry Pile Hammers, Nos. 9-B-2, 10-B-2 and 11-B-2 to put down 120-foot vertical and batter timber piles. These long piles, 30 inches diameter at the butt and 14 inches at the points, were driven to refusal. The penetration was about 100 feet, 80 feet of which was silt and 20 feet sand overlying rock.

Four hundred and fifty piles were driven in rows three piles wide and 460 feet long spaced on 3-foot centers. The displacement of these piles was about 1000 cubic yards for each row. On this job it was found that 3000 blows were required to put down to refusal the 30-inch diameter piles while only 100 blows were necessary for the 18-inch piles.

The 120-foot batter piles were driven by McKiernan-Terry No. 9-B-2 Hammers, the batter was 5½ inches in 12 inches.



No. 10-B-2 driving steel sheet piling

THE work here was on a new ship channel, Houston, Texas, for the Magnolia Petroleum Company. The Kiernan-Terry Pile Hammer, No. 10-B-2, was used for driving 40-foot steel sheet piling, of a deep trough section, to a penetration of 38 feet, through clay, sand and shell rock. Notwithstanding the thin web of the piling, there were scarcely any battered tops in consequence of the hard driving. This was another case of breaking records with a McKiernan-Terry Hammer, for the complete job of pile driving was finished in six days.

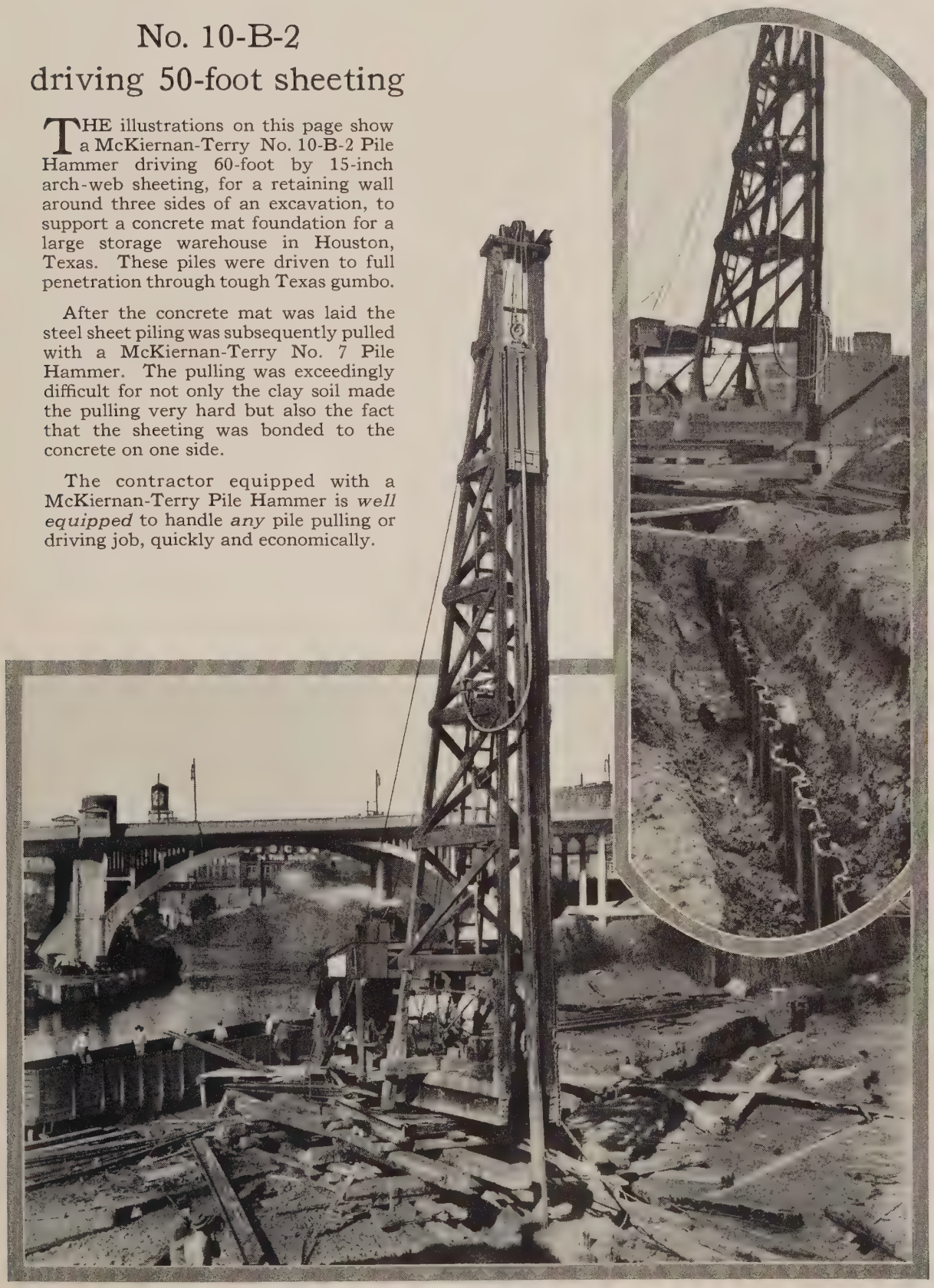
The speed of operation, low maintenance cost and unusual adaptability of McKiernan-Terry Pile Hammers assures economy on construction work that no up-to-date contractor can afford to overlook.

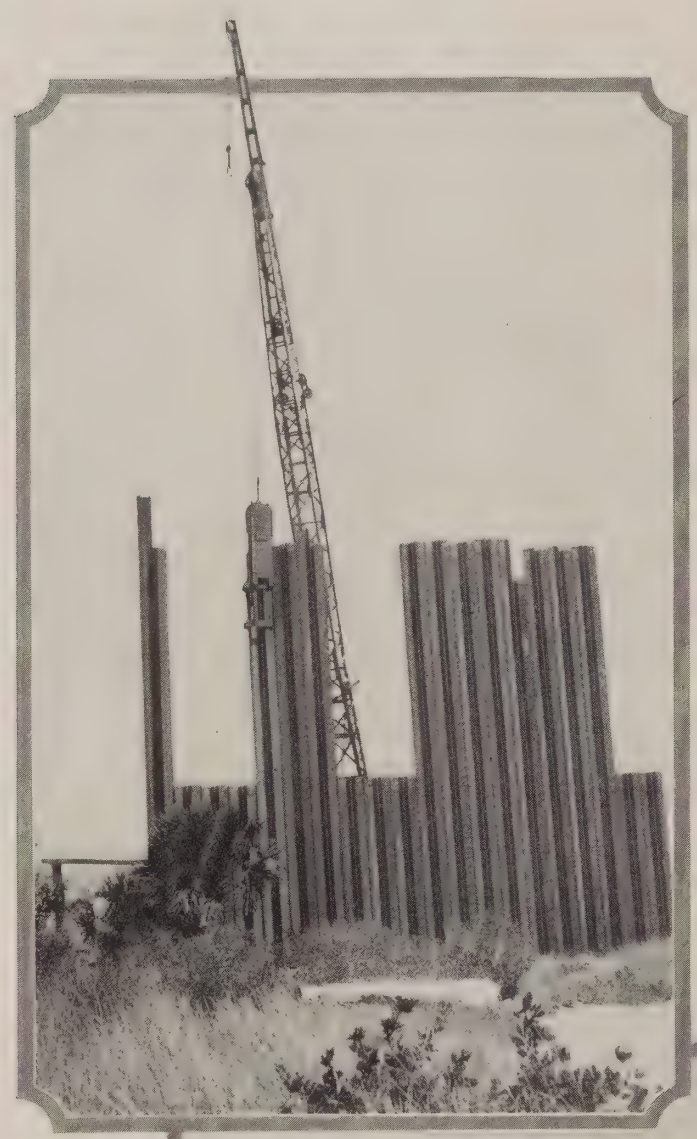
No. 10-B-2 driving 50-foot sheeting

THE illustrations on this page show a McKiernan-Terry No. 10-B-2 Pile Hammer driving 60-foot by 15-inch arch-web sheeting, for a retaining wall around three sides of an excavation, to support a concrete mat foundation for a large storage warehouse in Houston, Texas. These piles were driven to full penetration through tough Texas gumbo.

After the concrete mat was laid the steel sheet piling was subsequently pulled with a McKiernan-Terry No. 7 Pile Hammer. The pulling was exceedingly difficult for not only the clay soil made the pulling very hard but also the fact that the sheeting was bonded to the concrete on one side.

The contractor equipped with a McKiernan-Terry Pile Hammer is *well equipped* to handle *any* pile pulling or driving job, quickly and economically.





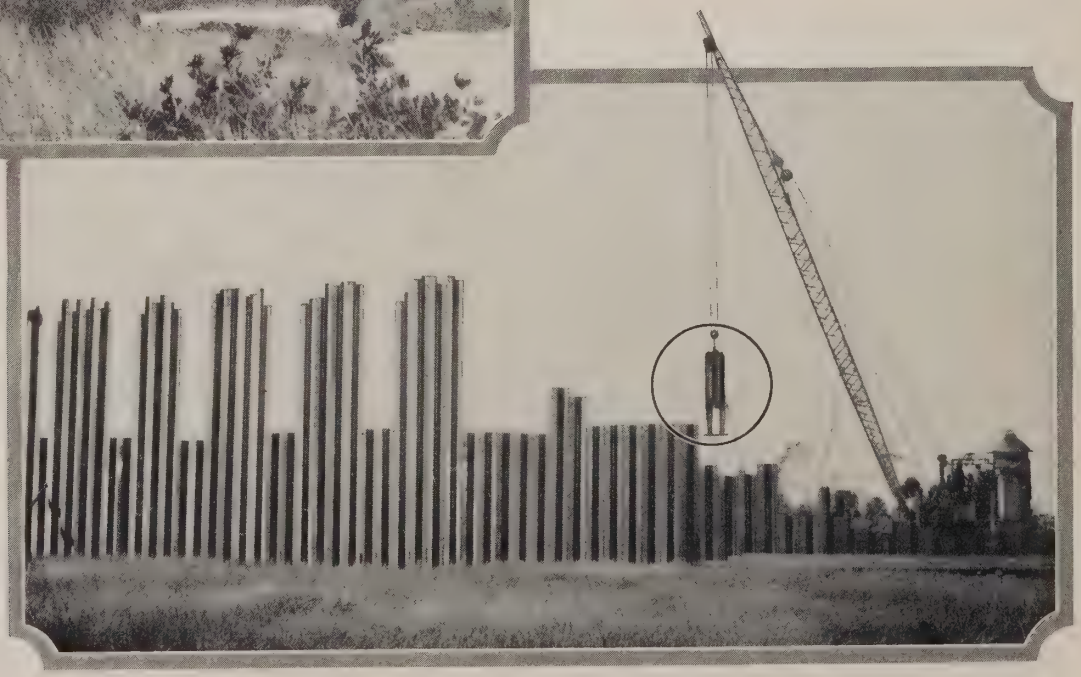
In Tampa, Florida

THIS job is a pier for ocean-going vessels being built on the shore property of a large industrial corporation in Tampa, Florida. The contractor on this work used McKiernan-Terry No. 10-B-2 Pile Hammers to drive the steel sheet piling in 45-foot lengths. This steel piling was driven to an average penetration of 32 feet in compact sand, shell and conglomerate limestone.

This is the largest steel sheet pile job built, up to this time, on the West Coast of Florida.

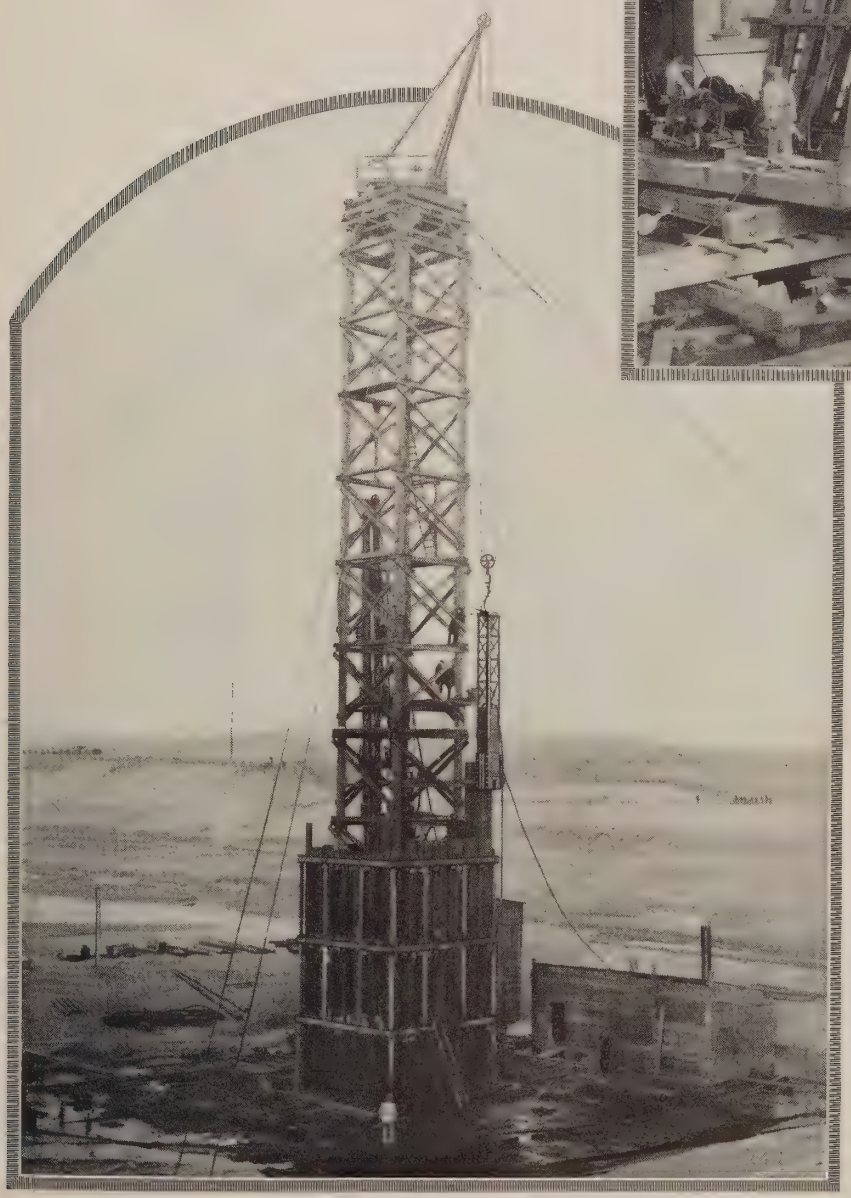
The contractor states that the hammer has done splendid work and in one 10-hour shift they made a record run of 40 of the 45-foot steel sheet piles driven to grade.

Here, as on many other steel sheet piling and pipe-pile driving operations, McKiernan-Terry Pile Hammers have been required to drive the piling to a considerable depth into rock. A pile hammer capable of this class of work must have stand-up ability built into it.



Difficult pile driving on this job

AT the right is shown a McKiernan-Terry Pile Hammer used by the U. S. Engineers' Office, Ouachita River, Louisiana. These sheet piles were driven to 50- and 60-foot penetration, in quicksand, gravel and clay. The piling manufacturer's engineer wrote: "It is safe to say that this is the hardest driving any steel sheet piling has ever been subjected to." After using one hammer for a year, the Government Engineers purchased two more.



Driving 95-foot steel sheet piles

THE picture at the left shows another difficult steel sheet piling job, with a pile hammer driving the longest known steel sheet sections, to penetration of 91 feet, without jetting. This work was in Yumiden, Holland, in beach sand covering a gravel and clay formation.

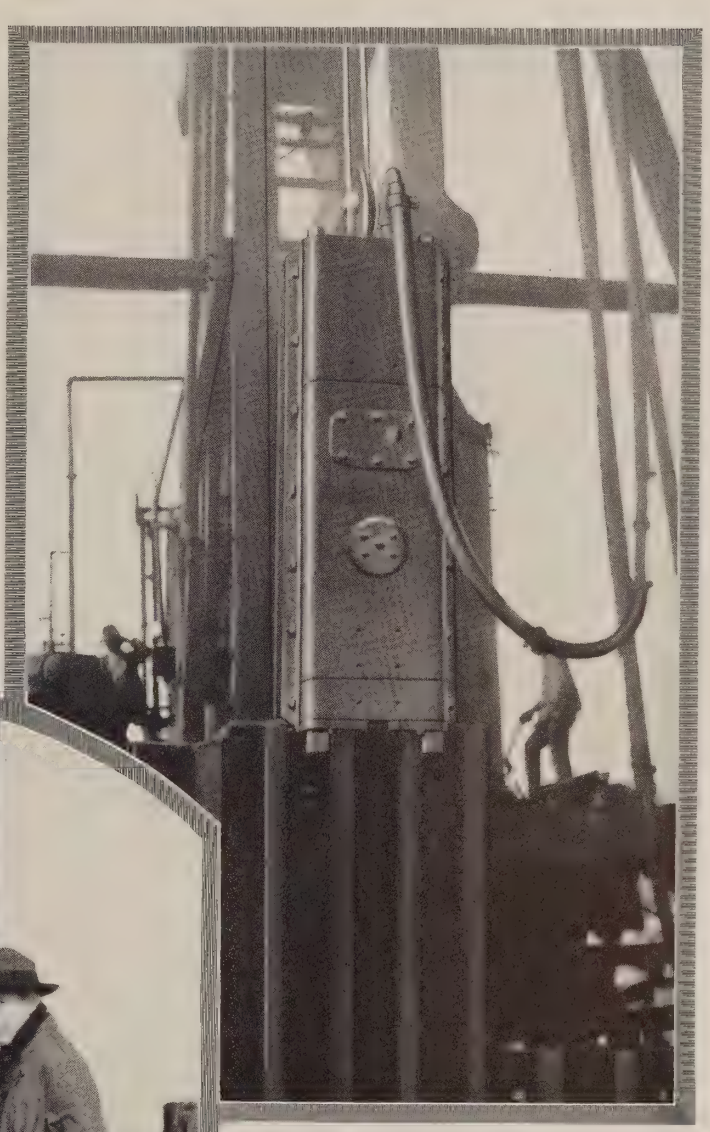
McKiernan-Terrys on Texas Highway Bridge

IN the construction of a bridge across the Red River on the Colorado to Gulf highway, a Texas contractor used McKiernan-Terry No. 11-B-2 Pile Hammer for driving 401 concrete piles, ranging from 20 to 45 feet in length. The average penetration was from 23 to 35 feet through quicksand and gravel and in some places through several feet of shale.

The bridge is 2553 feet in length, and is built on five pile bents spaced 34 feet 6 inches piles on 4 feet 9 inches centers, each bent consisting of four batters and one plumb pile.

Heavy sheet piles and hard driving

ON this page is shown a McKiernan-Terry Type B Pile Hammer driving steel sheet piles for the municipal dock on the St. John's River, Jacksonville, Fla. This work totaled about 3600 lineal feet of 12-inch steel sheet piling, with one immense master pile (lower picture) between every six sheet piles. The sheeting is 45 feet long and is driven to about 42 feet penetration through sand, mud, clay, phosphate, etc., and the master piles are 55 feet long and driven to about 52 feet penetration.



Inquiries are invited concerning difficult or unusual pile driving or pile pulling operations.

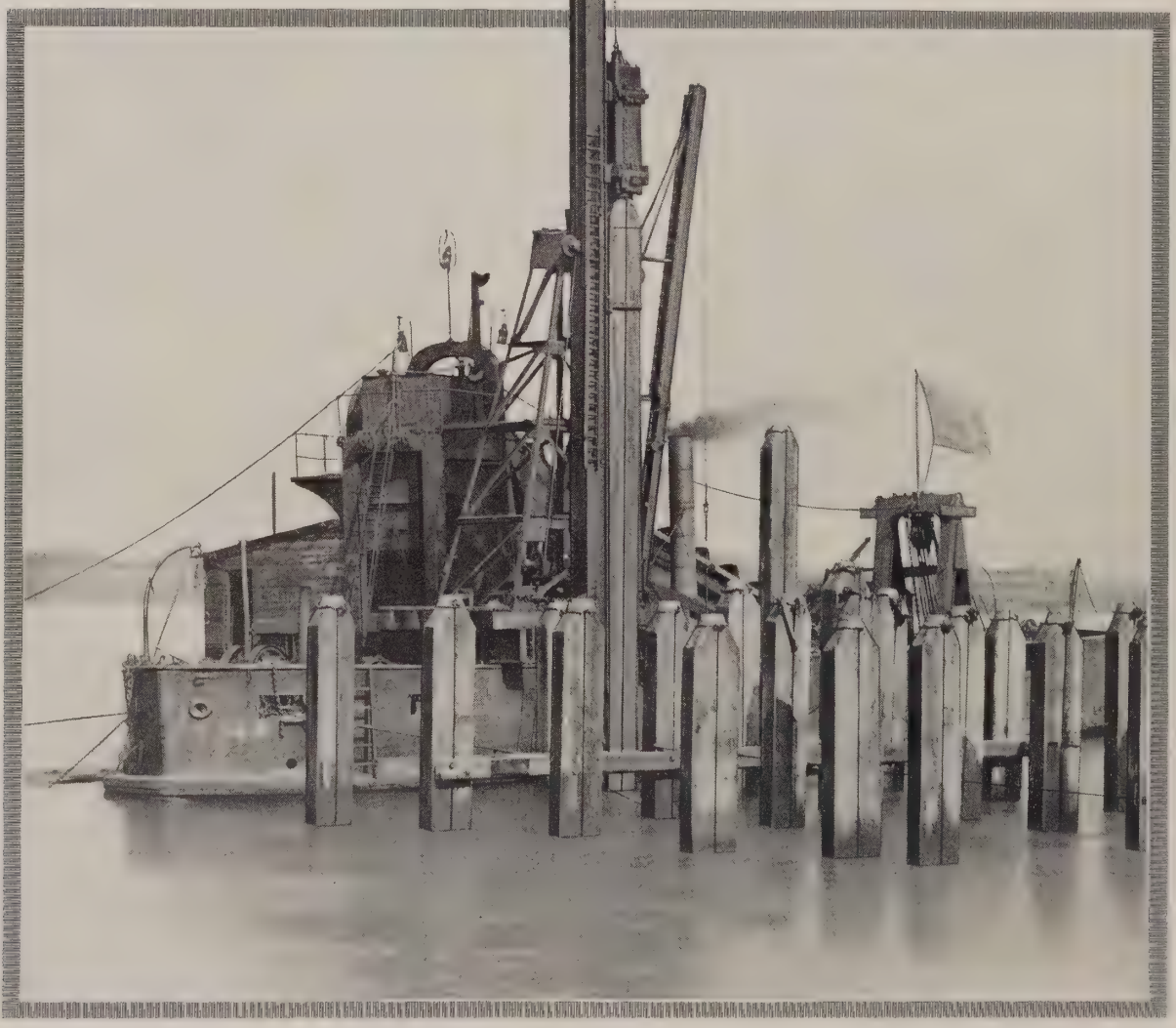
You are equipped for such jobs if you own McKiernan-Terry Hammers.

15½ x 31-inch timber piles 64 to 70 feet long

THE work here was for the Albert Docks, Thames River, London. The piles used averaged from 64 to 70 feet in length. Weighing 6½ tons, each pile was made of two timbers, 15½ inches square, securely bolted together. A 175-pound cast-iron shoe embraces the two timbers at the bottom end of the pile and there is an iron ring around a reduced section at the top for driving. The butt measurements, therefore, were 15½ by 31 inches.

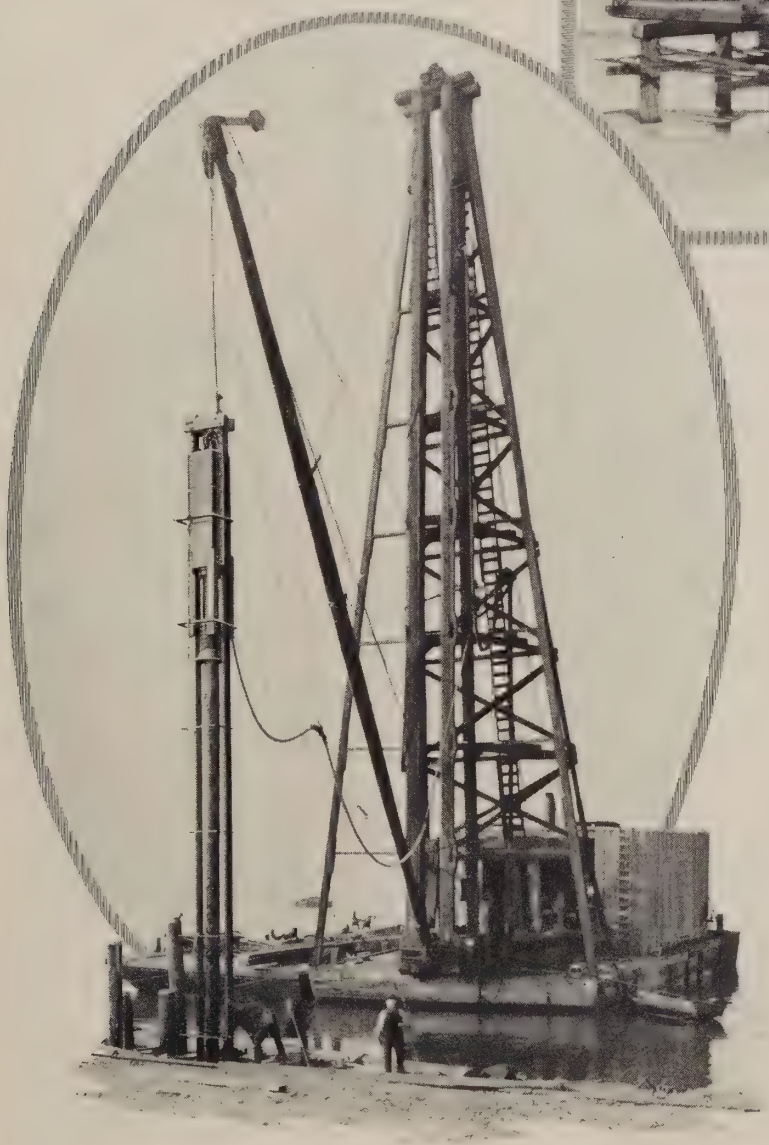
When it was found impossible to drive these piles with a 5-ton drop hammer, in less than three to four days, a McKiernan-Terry Type B Double-Acting Pile Hammer was employed. The Type B drove two of the mammoth piles per day, although only three or four hours were available, owing to tide conditions.

The piles were driven through river mud, clayey sand and gravel, to the chalk level. Probably the hardest driving was through 25 feet of the gravel, which in this vicinity is called Thames Ballast, and the recorded time of driving this part was 71 minutes per pile. This pile driving work aroused great interest in London engineering circles.



In Sydney, Australia

THE view at the right shows a swiveling and sliding pile-driver outfit used in Sydney, Australia, with a Type B McKiernan-Terry Pile Hammer in 30-foot leads. The piles are all 24 inches in diameter, 28 feet long, and driven in hard sand. The time occupied in placing piles in position and driving was 16 minutes per pile.



In California

THE lower picture shows another McKiernan-Terry Pile Hammer driving timber piles, in Oakland, Calif., for the foundation of the Fourteenth Street Municipal Wharf. This work included 380 40-foot green timber piles, driven through rip-rap fill for the retaining wall foundation. There were also 546 44-foot to 54-foot concrete piles, 18-inch butt, tapering to 10 inches (6 feet from the point). Then, in addition, 500 creosoted timber piles, varying from 40- to 55-foot lengths.

There were 1426 assorted piles altogether, and the hammer handled them all without the slightest difficulty.

16-inch x 65-foot heavy concrete piles

THIS picture shows a McKiernan-Terry Pile Hammer driving 16-inch semi-octagonal concrete bearing piles averaging 65 feet in length for the foundation of a New York City refuse pier around the west abutment of the Brooklyn Bridge.

Many of these piles were actually driven through rip-rap, where jetting was absolutely of no avail.

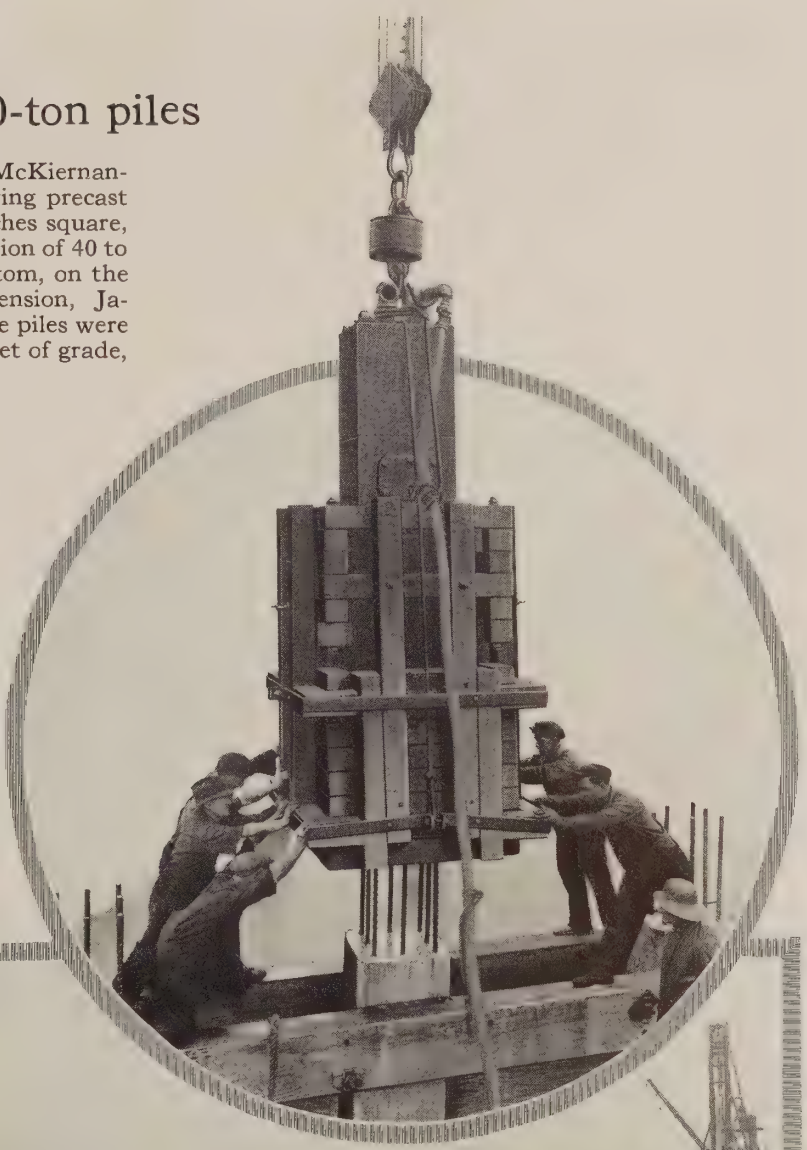
Eighteen inches was allowed for cut-off, and this was never exceeded, despite the fact that the only cushioning used was a coil of 2-inch manila rope between the pile top and the anvil block.

McKiernan-Terry Pile Hammers drive piles faster than other hammers of greater weight.

Driving 25 to 30-ton piles

THESE pictures show a McKiernan-Terry Pile Hammer driving precast concrete bearing piles, 24 inches square, 70 to 95 feet long, to penetration of 40 to 70 feet in sand and clay bottom, on the Woodhaven Boulevard Extension, Jamaica Bay, Long Island. The piles were first jetted to within 4 or 5 feet of grade, then driven to grade with the hammer. Jetted piles previously considered down for the required safe bearing load were subsequently driven from 8 to 22 inches per minute by the hammer, after having set for several months. Note in the upper picture the special base template which slipped over the reinforcing rods to protect them during driving.

The "impossible" driving jobs are done with McKiernan-Terry Pile Hammers.



Big concrete sheet and bearing piles 16-inch and 9 x 24-inch

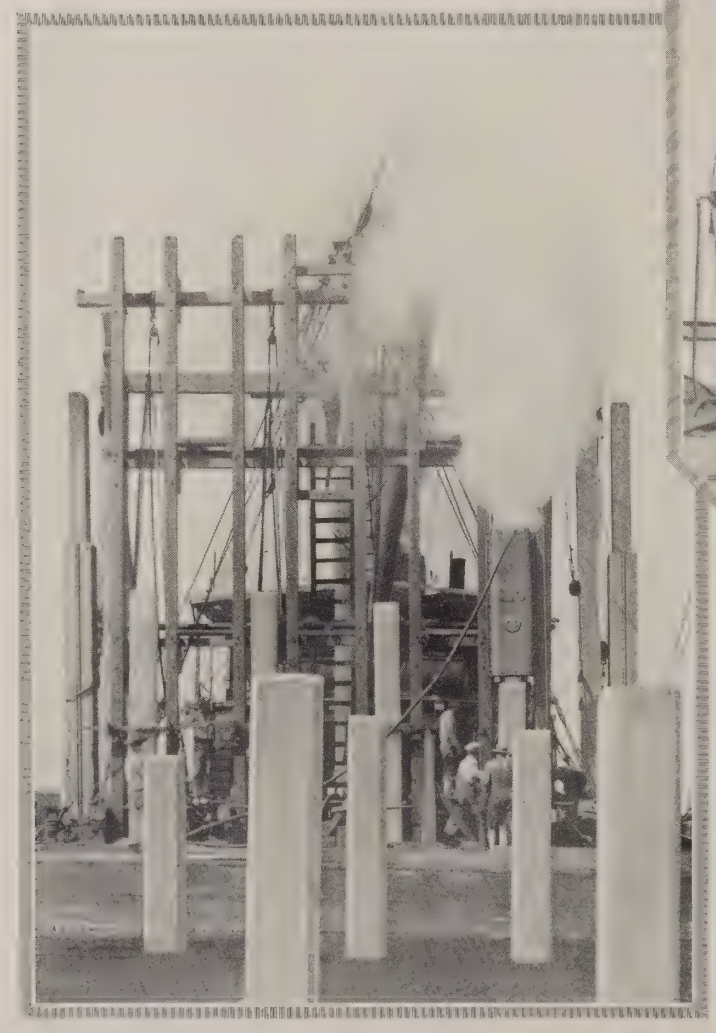
THE pictures on this and the next page show construction work on the 6-mile Gandy Bridge, Tampa, Fla.

The concrete piles shown are 16 inches square and from 20 to 60 feet in length. The longer piles were driven in a sand bottom to a total penetration of 45 feet, of which the last 4 or 5 feet was in disintegrated limestone rock.

Seventeen hundred of these piles were driven with McKiernan-Terry Pile Hammers. At a few places the bottom was devoid of overburden and there it was necessary to core bore the rock and in the bore holes the concrete piles were set butt end down.

There were also 700 precast concrete sheet piles, 9 x 24-inch, averaging 25 feet long, for bulkheads at either end of the concrete bridge, and these were driven by a Kiernan-Terry No. 7 Pile Hammer.

A 75-foot span bascule draw was included in the project. This was built upon eight steel cylinders driven into rock and filled with concrete. The cylinders were of ½-inch steel, 5 feet in diameter and 20 feet long, and were driven into coral rock by a McKiernan-Terry Pile Hammer with the aid of a specially designed cap which covered the entire top of the cylinder.

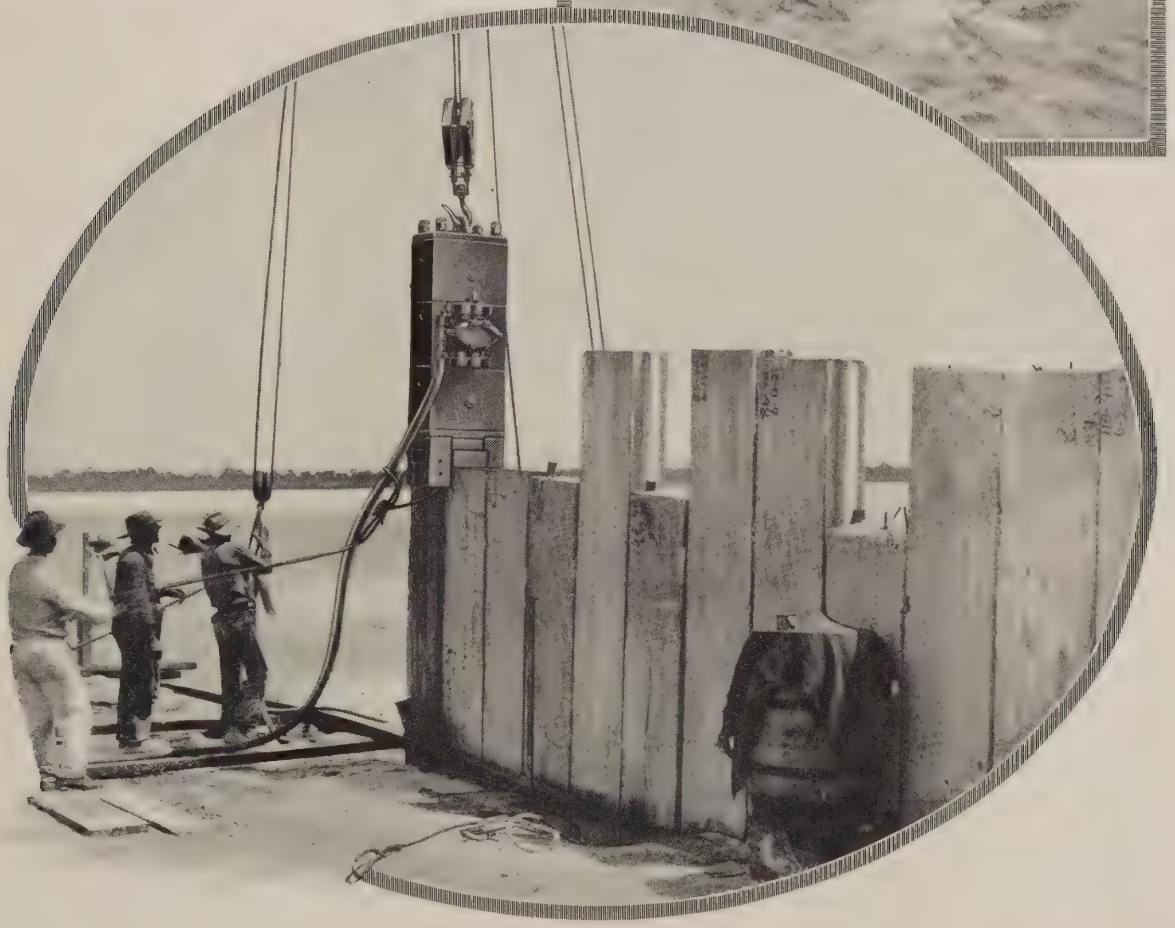


5-foot steel cylinders and 9 x 24-inch concrete sheet piles

THE picture at the right shows two of the 5-foot-diameter steel cylinders driven by a McKiernan-Terry Pile Hammer on the Gandy Bridge job, as described on the foregoing page.

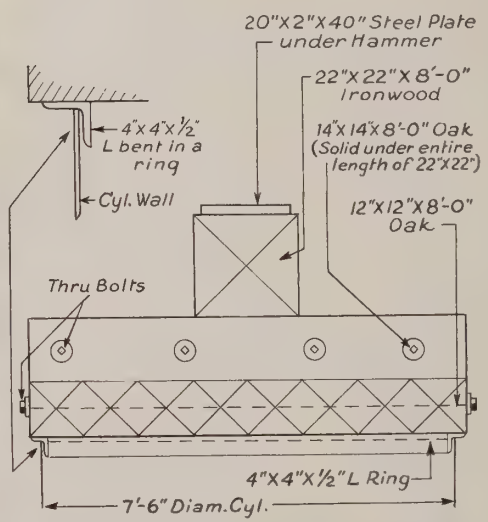
Below is shown a No. 7 McKiernan-Terry Hammer driving 9 x 24-inch precast tongue-and-groove concrete sheet piles, also for the Gandy Bridge job, Tampa, Fla.

These hammers gave excellent service on this job as they have on the many other large jobs where McKiernan-Terry Hammers have been used. This unusually hard work for a hammer of the weight of the No. 7 shows its stand-up ability.



Driving heavy steel cylinders

HERE are shown two views of the Oakland-Alameda subway job described and illustrated on page 42 of this book. In these pictures a Type B McKiernan-Terry Pile Hammer is driving 7-foot 6-inch steel cylinders, 105 feet long, to exact grade. After driving, these steel caissons were excavated from within, the water pumped out, and the concrete piers built to exact grade and alignment. The cylinders were then pulled.

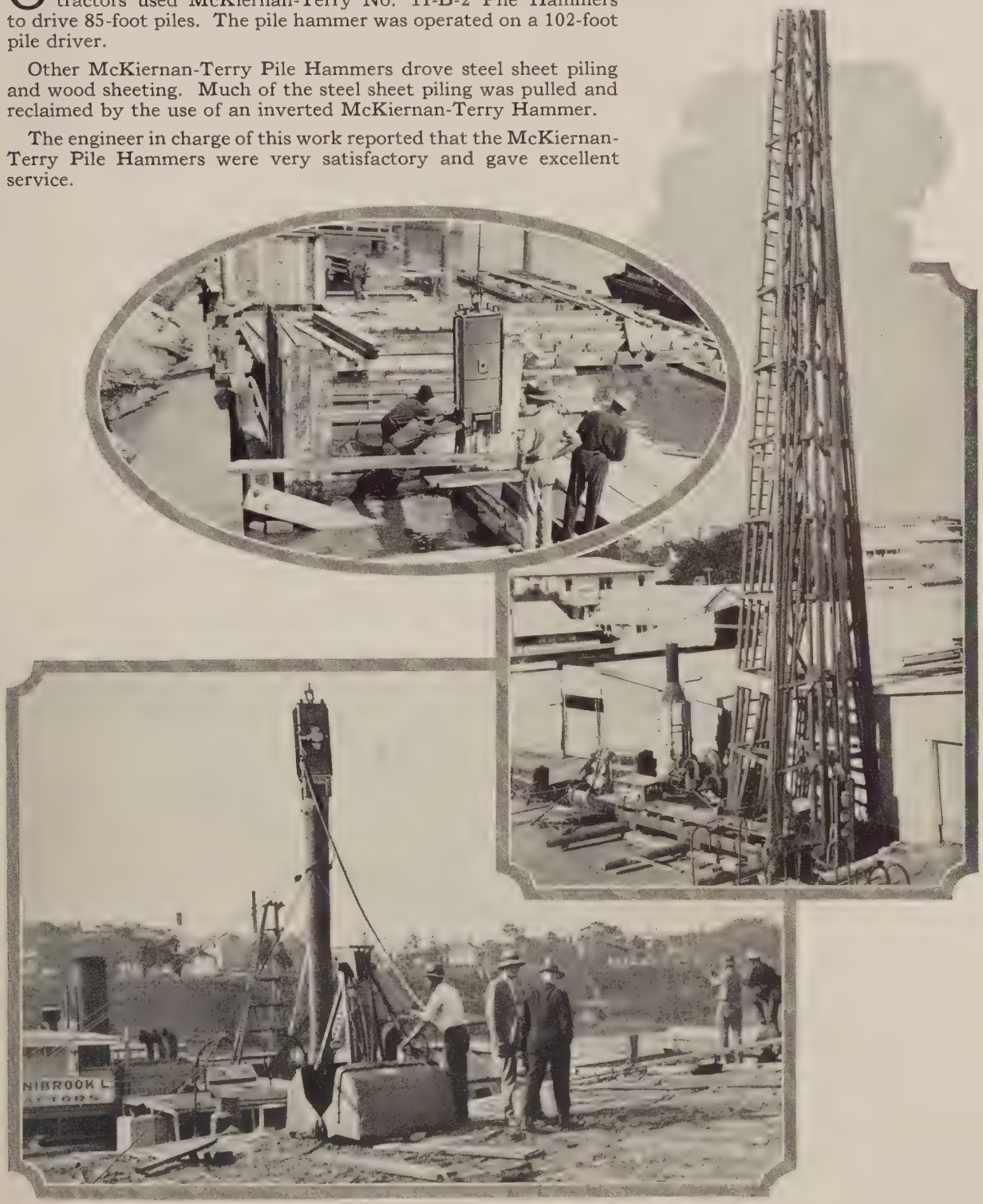


McKiernan-Terry Pile Hammers at work in Australia

ON recent bridge contracts in Brisbane, Australia, the contractors used McKiernan-Terry No. 11-B-2 Pile Hammers to drive 85-foot piles. The pile hammer was operated on a 102-foot pile driver.

Other McKiernan-Terry Pile Hammers drove steel sheet piling and wood sheeting. Much of the steel sheet piling was pulled and reclaimed by the use of an inverted McKiernan-Terry Hammer.

The engineer in charge of this work reported that the McKiernan-Terry Pile Hammers were very satisfactory and gave excellent service.



McKiernan-Terry Subaqueous Pile Hammers

For Subaqueous Driving

No. 9-B-2
No. 10-B-2
No. 11-B-2

ANY McKiernan-Terry Type B Pile Hammer can be used for subaqueous pile driving by merely supplying compressed air to the bottom cylinder and carrying the exhaust from the power cylinder above the surface with a hose.

Subaqueous Pile Driving

UNTIL quite recently, pile driving under water was always difficult and expensive. It required great skill and caution, and the results sometimes were not wholly satisfactory, owing to the difficulty of determining accurately the bearing power of piling driven under water by means of followers. It has been only a few years since McKiernan-Terry Pile Hammers revolutionized this kind of work, yet the methods illustrated in these pages have already been adopted by contractors everywhere.

On one of the very first jobs where McKiernan-Terry Subaqueous Hammers were used, the contractor stated that by this method the total cost of pile driving was less than the former cost of sawing alone. It is not surprising, therefore, that McKiernan-Terry Subaqueous Hammers were immediately in great demand and have been ever since. It has now been demonstrated that piles can be driven under water almost as easily as on land, even to depths of 80 feet or more.

The new Subaqueous Pile Hammers are simply the standard McKiernan-Terry Type B machines, in which provision is made for supplying compressed air to the bottom cylinder of the hammer. This is done by means of an air hose connected as shown in the diagram on page 93. About 60 cubic feet of compressed air per minute is sufficient volume for any Type B hammer, and about one-half pound pressure is required for every foot of submergence. This pressure is sufficient to prevent water from entering the cylinder and interfering with the reciprocating movements of the ram. The exhaust from the pile hammer is carried to the surface through another hose. Either steam or compressed air can be used for the motive power.

With a movable and unyielding anvil block resting on the pile, and with the driving ram of the hammer working in its cylinder with the surrounding water completely excluded, the full force of the ram is delivered to the pile. The efficiency of driving is the same as though the work were being done above the surface, and the bearing power of the piles can be determined in the usual way.

The subaqueous pile hammer eliminates the use of followers, a feature which engineers appreciate, and also practically eliminates submarine sawing. By the new method the piles are driven so close to grade that in most cases no sawing is necessary. This is especially important in cofferdams, where formerly the bracing made pile sawing very difficult and expensive.

Compared with older methods of pile driving under water, the advantages of driving with McKiernan-Terry Subaqueous Pile Hammers are as follows:

Shorter piles; less waste of timber.

Elimination of follower; full force of blow delivered to pile; bearing power determined as on the surface.

Piles are driven straight.

Piles can be spaced accurately.

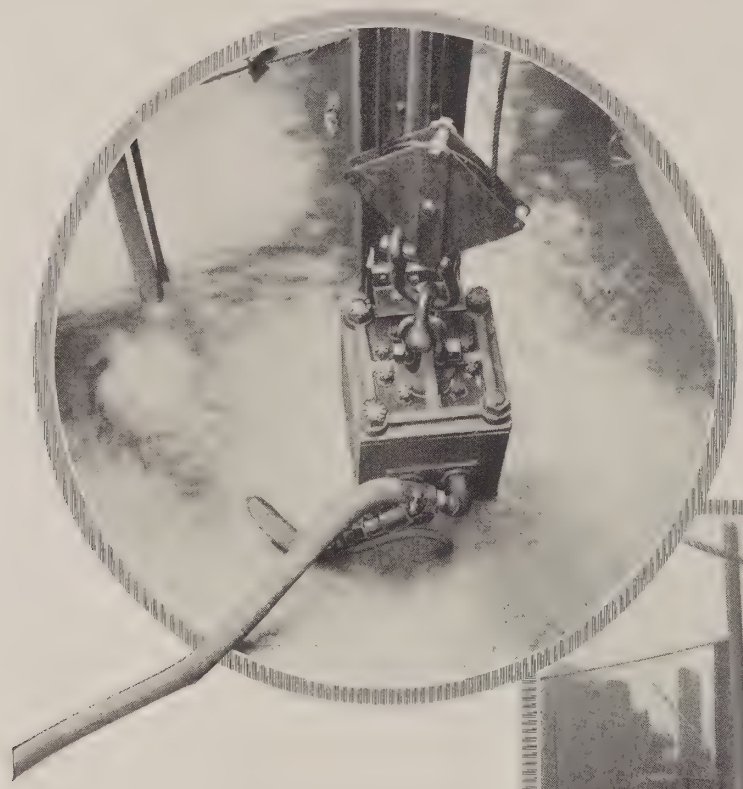
No delays on account of high water.

Divers not required except for inspection and occasional sawing.

Such sawing as is necessary is made easier, as only short pile sections need be sawed off.

The Subaqueous Pile Hammer permits driving foundation piles in large and deep cofferdams before unwatering, thus preventing disturbance of ground materials caused by the hydrostatic pressure that exists when cofferdams are unwatered before piles are driven.

The McKiernan-Terry Corporation own the patents in the United States and foreign countries for subaqueous pile driving apparatus, covering double-acting, single-acting and drop hammers.



McKiernan-Terry Pile Hammers working under water

LOOKING down on the top of a Subaqueous Pile Hammer while operating partly under water.

The agitation of the water is caused by the escape of air from the bottom of the hammer.

At the right, McKiernan-Terry Subaqueous Pile Hammer completely submerged. The man holds a line with a knot so placed that it shows when the pile reaches grade.

In this case the Subaqueous Hammer was mounted upon a carriage which slid up and down the spud shown in the picture.

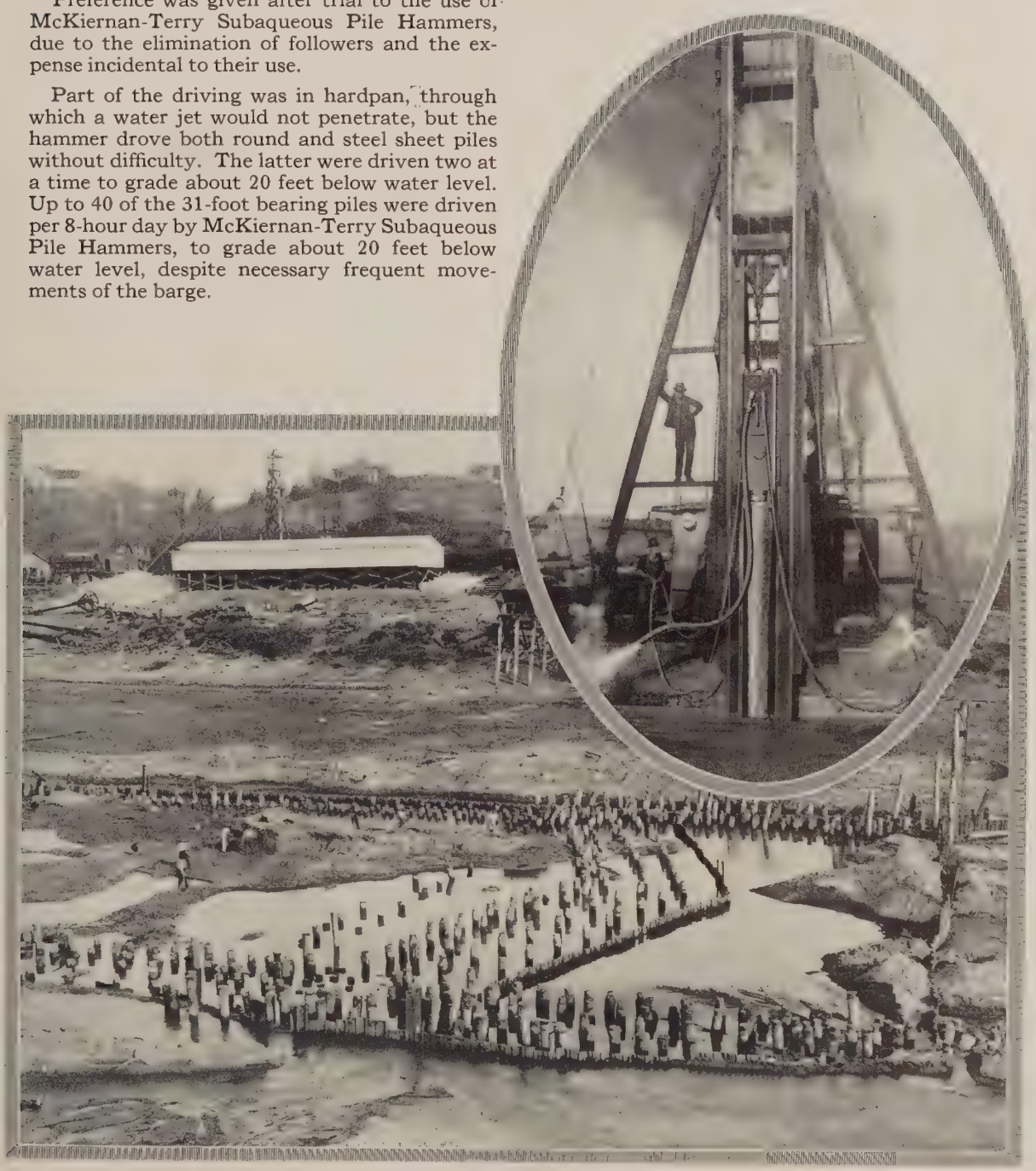
On the Ohio River—Subaqueous-driven piles

THE work here was on Dam No. 47, Ohio River, and included some 3000 round foundation piles, 26 to 31 feet long, and 2000 steel sheet piles, 20 to 30 feet long. The entire work was enclosed in one cofferdam, extending for 2200 lineal feet along the river bank.

Preference was given after trial to the use of McKiernan-Terry Subaqueous Pile Hammers, due to the elimination of followers and the expense incidental to their use.

Part of the driving was in hardpan, through which a water jet would not penetrate, but the hammer drove both round and steel sheet piles without difficulty. The latter were driven two at a time to grade about 20 feet below water level. Up to 40 of the 31-foot bearing piles were driven per 8-hour day by McKiernan-Terry Subaqueous Pile Hammers, to grade about 20 feet below water level, despite necessary frequent movements of the barge.

On similar Ohio River work as many as three or four McKiernan-Terry Subaqueous Hammers were used at each dam. Most of the work was done by the U. S. Engineer Corps and the remainder under their direction.

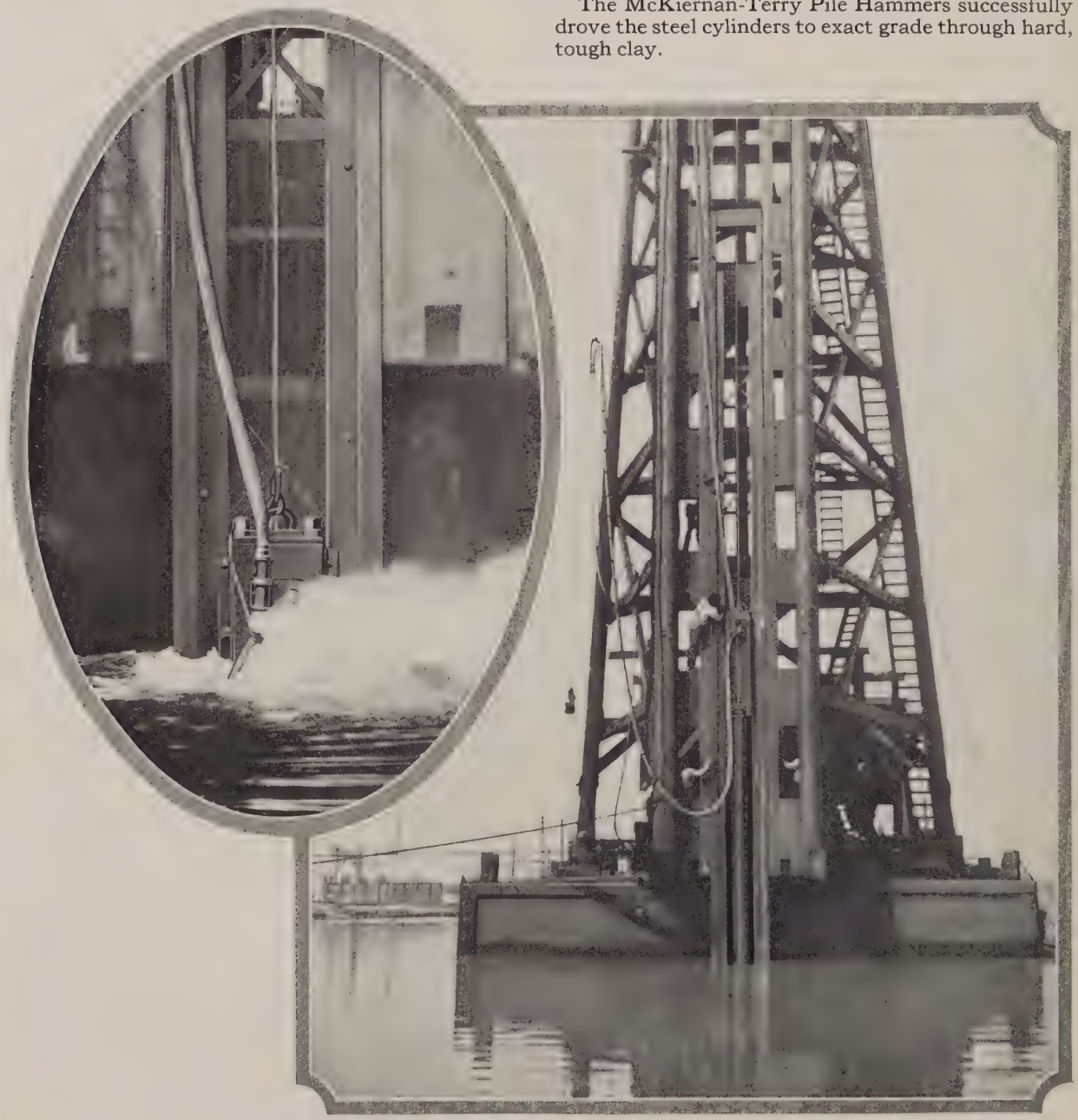


Another big under-water driving job in California

THE pictures on this and the foregoing page show a McKiernan-Terry No. 9-B-2 Pile Hammer driving 60-foot timber piles for the foundation of the Alameda Portal Building, at the end of the Estuary Vehicular Tube between Oakland and Alameda, Calif. There were 525 of these piles, driven under water to exact grade from 34 to 40 feet below the surface. Extension leads 90 feet long were used. The same hammer then drove 1200 more timber piles, 80 feet beneath the surface. On the former driving the No. 9-B-2 averaged 26 piles in 7 hours.

Another Type B McKiernan-Terry Hammer was also used on this job, for driving heavy steel sheeting and large steel cylinders. The latter were 7½ feet in diameter and 105 feet long. A floating equipment with wide spread leads 110 feet high was used for this purpose, with a special cap made of heavy timber, as shown on page 36.

The McKiernan-Terry Pile Hammers successfully drove the steel cylinders to exact grade through hard, tough clay.



Subaqueous driving on bridge foundations for Gulf Coastal Highway

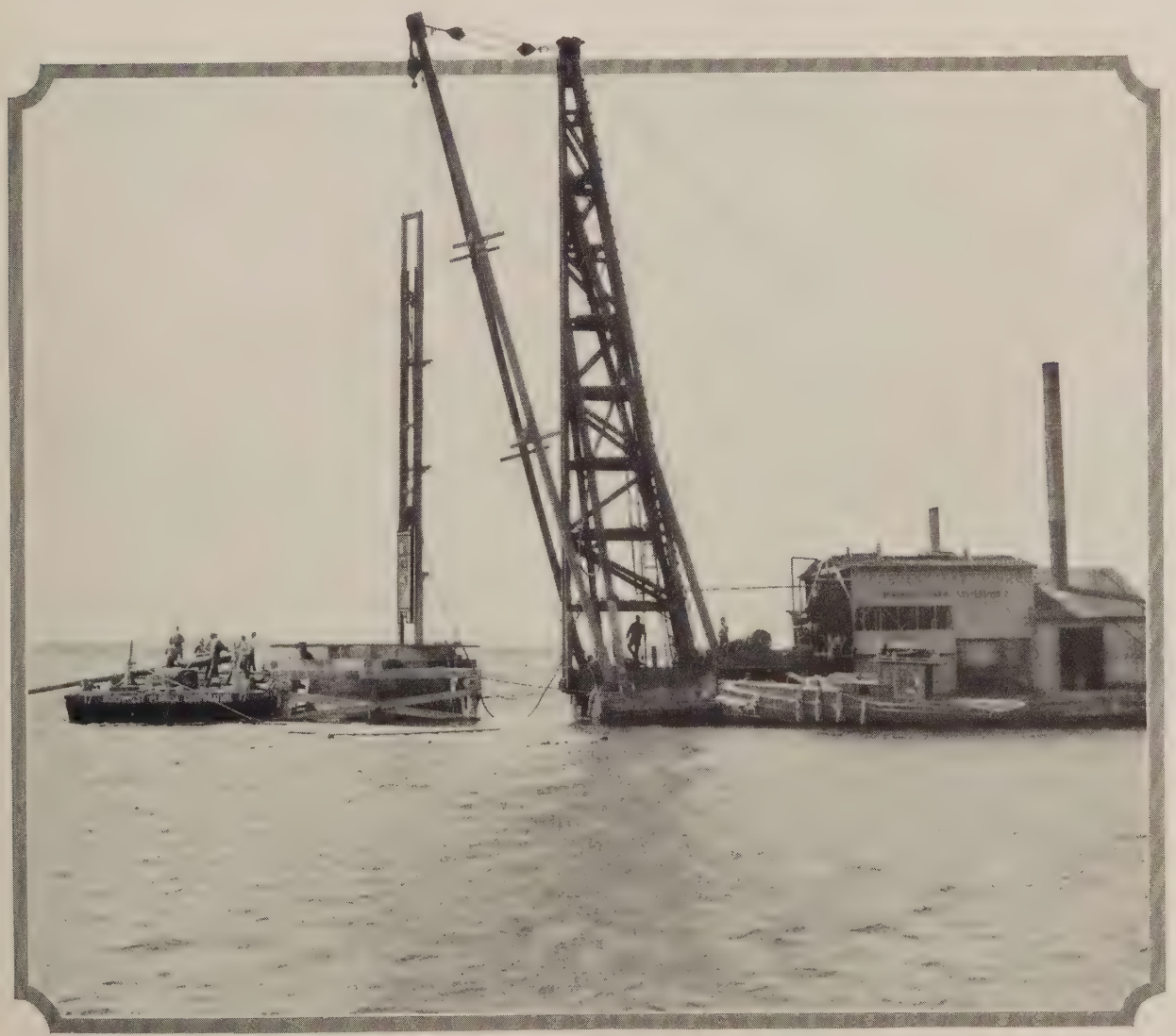
ON this job, 80-foot piles were driven by McKiernan-Terry No. 10-B-2 Pile Hammers in swinging leads, 54 feet long, with a 36-foot extension. The extension allowed the hammer to be lowered to any depth under water.

This work at Panama City, Florida, was done for the Florida State Highway Department, across St. Andrew's Bay on the Gulf Costal Highway.

The use of McKiernan-Terry Pile Hammers on this job kept the work well ahead of schedule and saved money for the contractor. McKiernan-Terry Hammers are always found on big jobs.

Ever since it was demonstrated that piles could be driven under water almost as easily as on land, even to depths of 80 feet and below, McKiernan-Terry Subaqueous Pile Hammers have been in great demand.

Contractors who previously had to saw off the piles under water have saved considerable profits by using the subaqueous hammer, the efficiency of the driving being the same as though the work was done above the surface.



Fast subaqueous driving on Greenpoint Bridge, Brooklyn, New York

ON this construction job, the contractor used a McKiernan-Terry No. 10-B-2 Pile Hammer to drive 1400 bearing piles, 30 to 35 feet in length, to full penetration in the creek bottom. By use of the subaqueous hammer much shorter piles could be used than by the older method of driving long piles and cutting them off under water.

An average of 75 piles a day were driven with a maximum of 104 piles. The McKiernan-Terry Hammer was hung from telescopic leads on the pile driver barge.

The Greenpoint Avenue Bridge, across Newton Creek, connects Brooklyn with Long Island City.

Subaqueous driving in Denmark

ON the pier foundations of a bridge for the Danish State Railroads, a Danish contractor used a McKiernan-Terry No. 10-B-2 for driving concrete piles 27 to 46 feet below water level.

The concrete piles were 12 inches square and 64 feet in length and were driven in 50 feet of water through gravel, sand and hard blue clay.

The McKiernan-Terry Hammer was mounted on a floating frame 40 feet high with telescopic leads 78 feet long, permitting the leads to rest on bottom while the big piles were being driven.

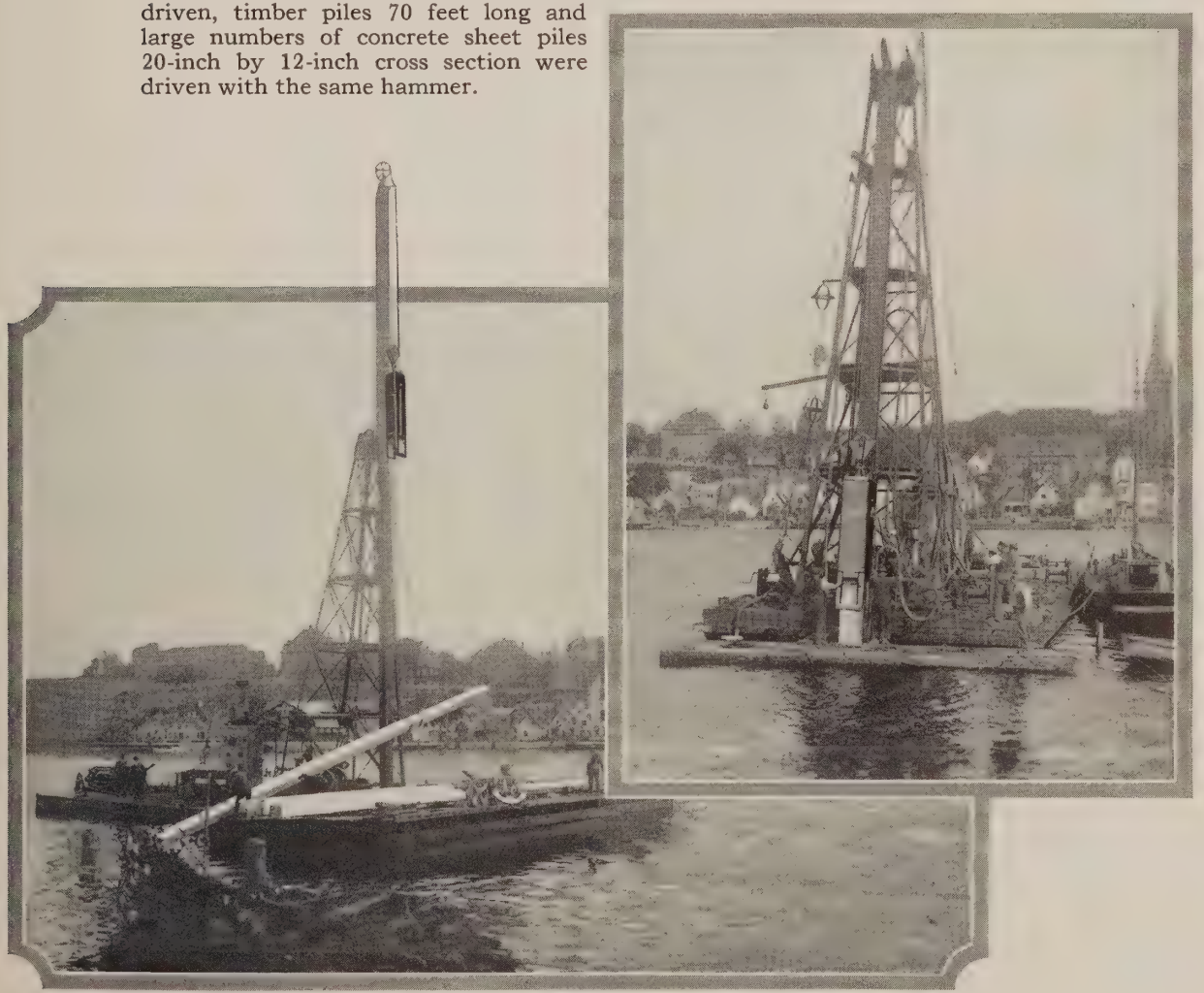
None of the heads of these concrete piles were broken during the driving.

In addition to the concrete piles driven, timber piles 70 feet long and large numbers of concrete sheet piles 20-inch by 12-inch cross section were driven with the same hammer.

The use of a McKiernan-Terry Subaqueous Pile Hammer on this job eliminated the use of followers also practically eliminated under-water sawing of the piles. Most of the piles were driven so close to the grade that no sawing was necessary.

On one job by this method of driving the contractor stated that the total cost of pile driving was less than the former cost of the sawing alone.

A large number of McKiernan-Terry Pile Hammers are shipped annually to other countries for important construction jobs.



On land or under water with McKiernan-Terry Pile Hammers

ON the waterfront section of the new plant of the Western Electric, Kearny, New Jersey, McKiernan-Terry Pile Hammers were used for both subaqueous and land driving. Three Type B McKiernan-Terry Pile Hammers drove all the foundation piles and cofferdam steel sheeting.

During this construction, the foundation piles were driven first and subsequently a cofferdam of steel sheet piling was driven around them. The cofferdam was pumped out, after which the concrete was poured into the forms.

The hammers on this work gave excellent service both on the land rigs and under water. Other pictures of this work is shown on pages 8, 9 and 22.

13,200 Piles driven with subaqueous hammers

THE work shown on this page was on a 4-track steel bridge for the Central Railroad of New Jersey, across Newark Bay from Bayonne to Elizabethport. Seventy-two piers were built in cofferdams which rested on piles driven to within 2 or 3 feet of the bottom of the bay. The piles were driven first, the cofferdams later being set on the pile tops. The bottom of the bay was compact sand and gravel. The piles were 40 to 45 feet long; butts 12 to 14 inches in diameter. At low water the pile tops were about 40 feet below the surface. Two McKiernan-Terry Hammers were used in 85-foot pile driver leads supporting 70-foot telescopic leads in which the hammers operated. The pile was drawn up into the bell-bottom anvil block of the hammer and secured at the lower end by two knives, as shown in the larger picture. The telescopic leads were then lowered to the bottom and the hammer started driving, the knives dropping down and disengaging after the first few blows. Some of these piles were driven in 3 to 5 minutes.

No. 11-B-2 Pile Hammer on Flushing Creek Bridge

THE foundation piles on this job were driven in the cofferdams with a floating driver using a McKiernan-Terry Double-Acting Subaqueous Hammer which worked in auxiliary leads moving in the fixed leads.

Each pier foundation contained about 1300 piles, spaced a fraction less than 3 feet on centers. Spruce piles were used, in lengths from 20 to 35 feet with butt measurement of 12 inches and point of 6 inches. The driving was very hard, and piles were driven to practical refusal; the penetration under the last ten blows indicated a bearing power of about 30 tons. The penetration varied from 20 feet average in the west pier to 25 feet in the east pier. With seven men on the driver, about 85 piles were driven in an 8-hour shift, and the greatest number was 107.

Much better results were obtained with the subaqueous hammer than could have been obtained by other methods, due to the accuracy of spacing and speed of driving, as no followers or jet were required.

60-foot piles driven 10 feet under water

ON the high level bridge (right) of the Lackawanna Railroad across the Hackensack River, Kearny, New Jersey, 52 piles were driven in 8 hours, 10 feet below mean low water level, by a New York contractor.

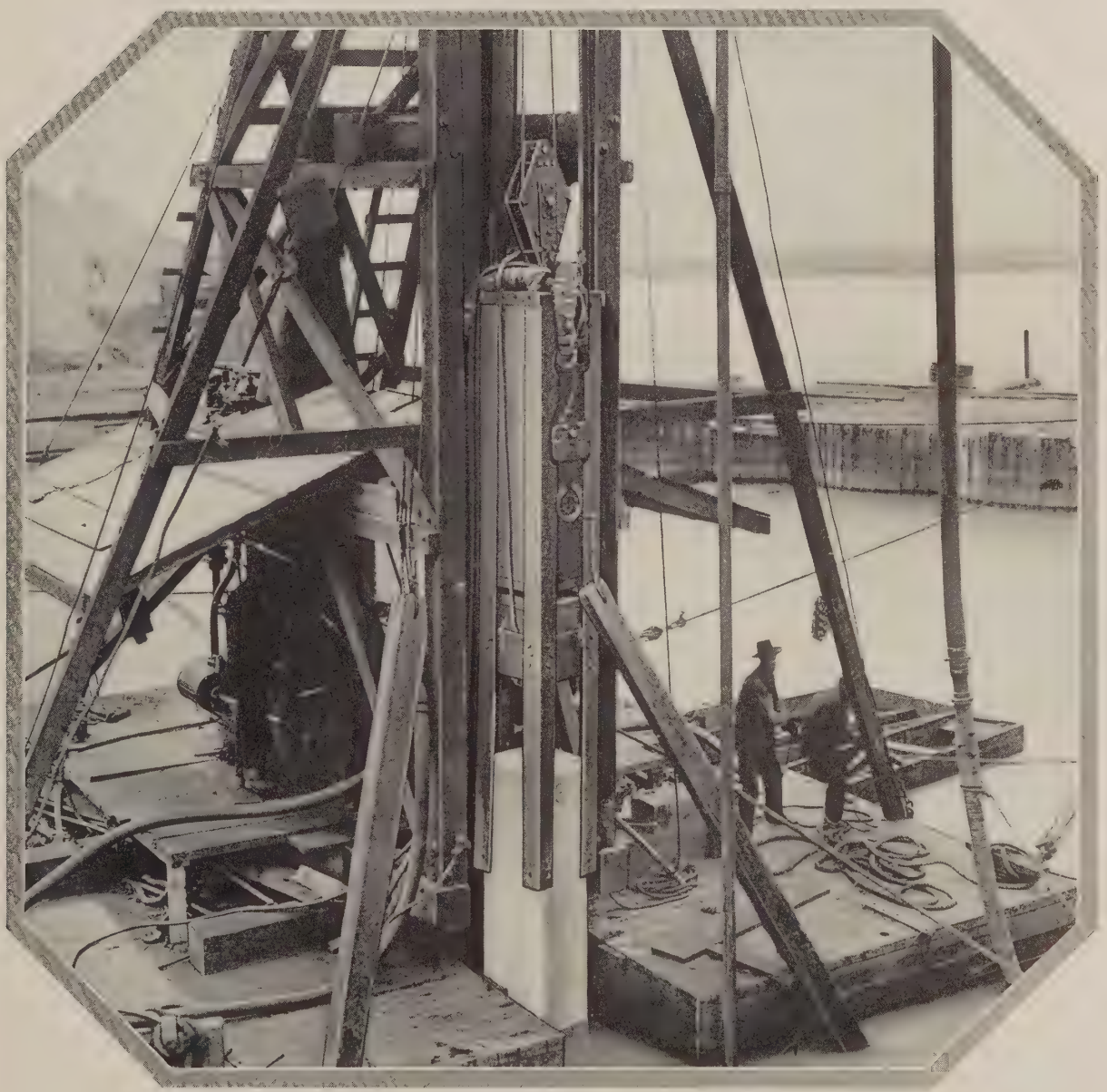
In the cofferdam 296 timber piles, 60 feet in length, were driven with a McKiernan-Terry No. 9-B-2 Pile Hammer, fitted with a tubular extension instead of operating the hammer in telescopic leads or on a driving spud.

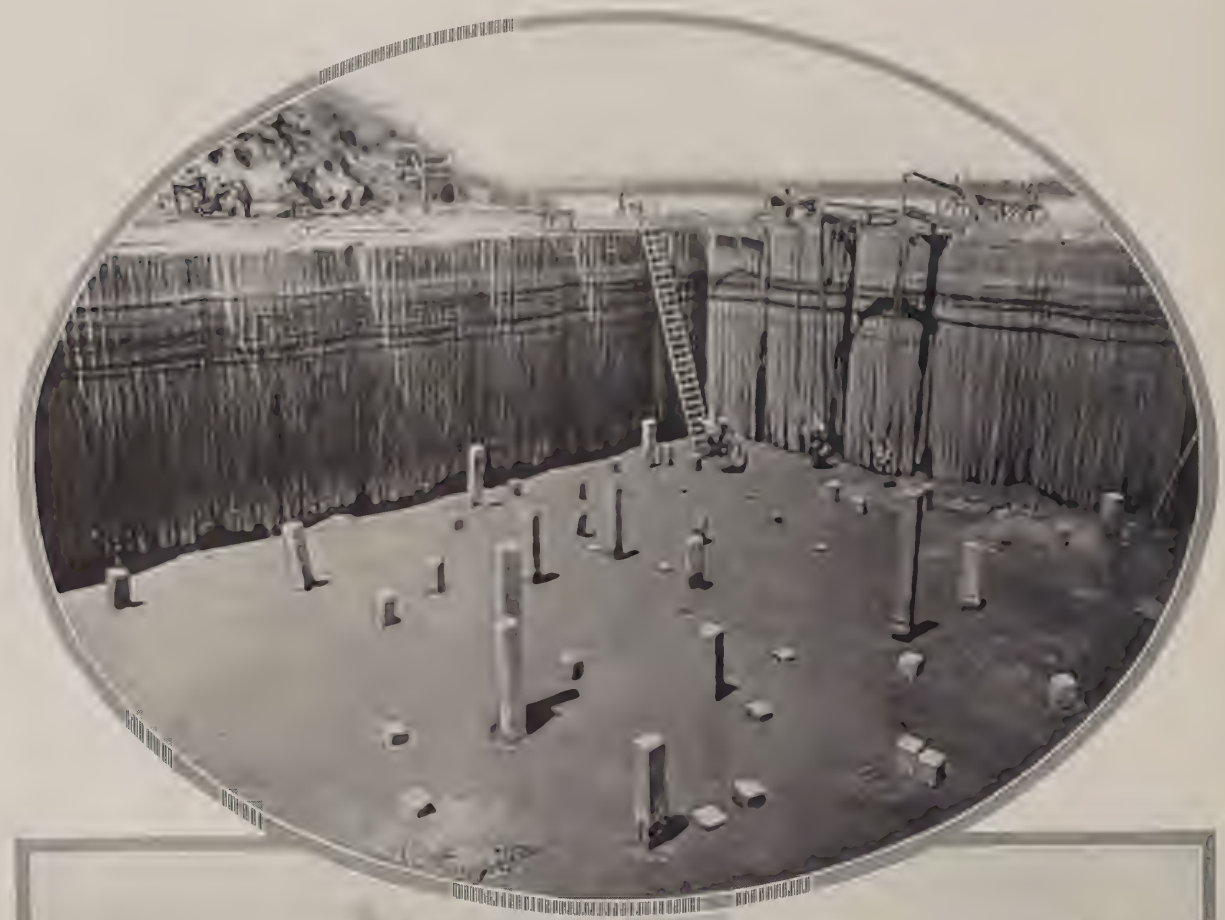
62,000 Feet of concrete piling

THIS illustration shows a McKiernan-Terry Type B Pile Hammer being set down over a 48-foot reinforced concrete pile. The tops of these piles came to rest about 30 feet under the surface of the water.

This work was on the foundation for the Howard Bend Water Works Plant, Hine, Mo., built for the city of St. Louis. Several McKiernan-Terry Pile Hammers were used. Nos. 6 and 7 drove 48-foot and 56-foot steel sheet piling and then pulled it, and the Type B machines were used for the heavy concrete piles as shown in this picture.

These piles were from 48 to 68 feet long, and made a total of about 62,000 feet of piling. For other pictures see next page. No piledriving is too difficult for a McKiernan-Terry Pile Hammer.





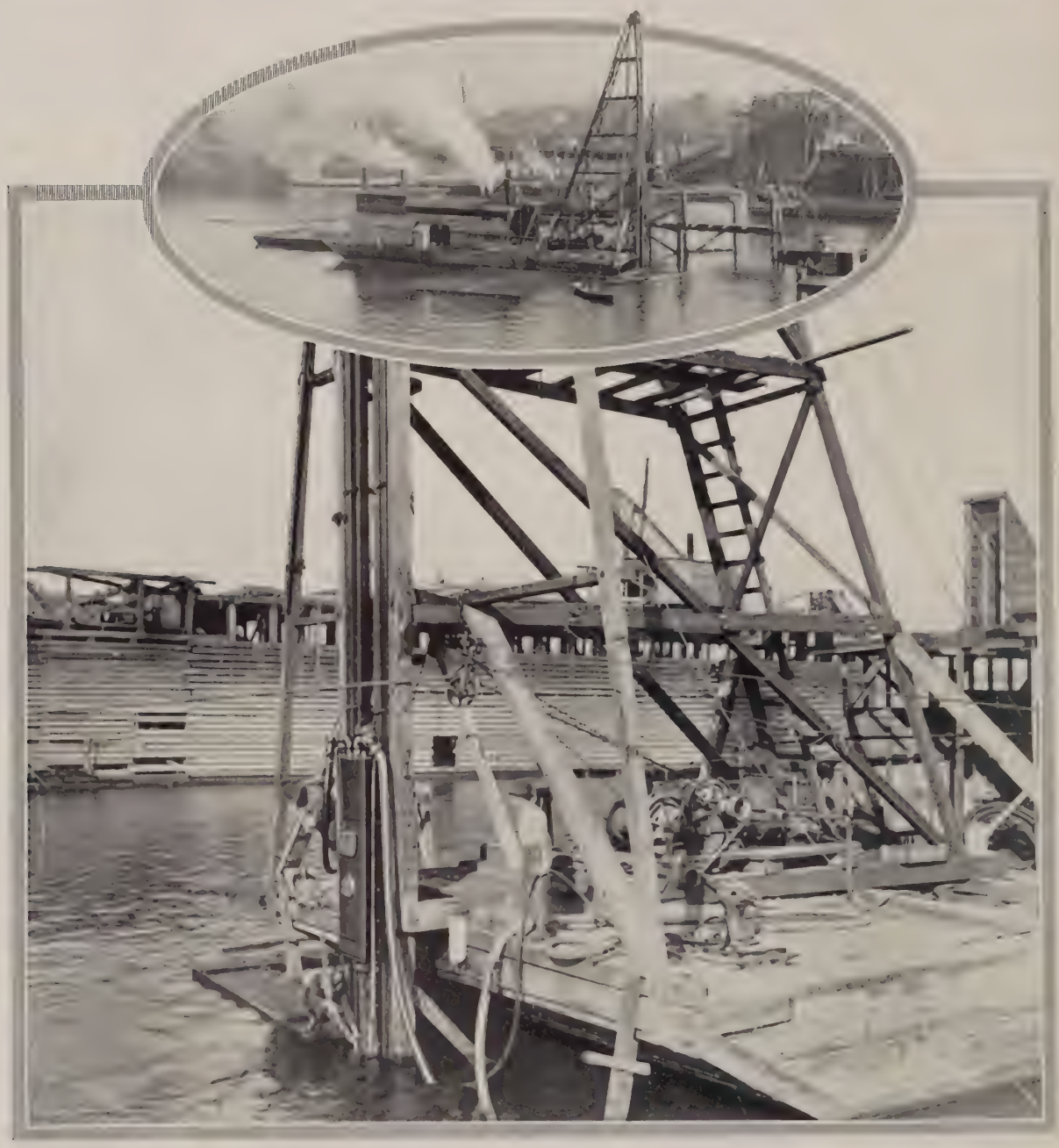
Nearly twelve miles of concrete bearing piles

THE upper picture on the opposite page shows a low service cellular cofferdam constructed for the Howard Bend Water Works Plant, Hine, Mo., for the City of St. Louis. In this view the cofferdam has been unwatered, and the few piles showing through the mud are the ones which did not drive to rock, of which there were about 30 out of 538. The pile driving was done with McKiernan-Terry Subaqueous Pile Hammers before the cofferdam was unwatered. The bottom shown in the picture consisted of 3 or 4 feet of soft mud deposited by a sudden rise in the river, this mud being on top of 5 feet of concrete.

The lower picture on the opposite page shows the high service cofferdam on the same job. These piles were 68 feet long, driven to rock, with the pile tops coming to rest in about 10 feet of water. There were 37,000 lineal feet of these 68-foot concrete piles, and 25,000 lineal feet of the 48-foot concrete piles.

The picture on this page is another view of this same job, showing a McKiernan-Terry Pile Hammer driving heavy interlocking concrete sheet piles for bank protection.

McKiernan-Terry Pile Hammers do their hardest driving without damaging the pile tops.



Driving 80 feet under water

THIS McKiernan-Terry Pile Hammer drove 1000 piles, 800 of them under water, working three shifts daily. The specifications called for 12-inch diameter minimum at the small end of the pile, the water was 80 feet deep, and the river bed consisted of sand and coarse gravel. The contractor stated that the McKiernan-Terry Subaqueous Hammer was the only practical method of doing the work, driving piles from 40 to 50 feet long entirely under water.

Penetration was from 25 to 32 feet and an average of one pile every 25 minutes was maintained, including the time of placing and securing it in the leads, then lowering and driving to the required penetration. Compressed air was the power used both for the operation of the pile hammer and for charging the ram cylinder when working under water.

The main leads were 110 feet long—70 feet above water and 40 feet below. The telescopic leads were 70 feet long. The piles were secured in the leads by knives as described on page 47.

7000 Piles driven for foundation of Washington Bridge

ON this job 7000 piles were driven, 328 of which were concrete, with five McKiernan-Terry No. 11-B-2 Pile Hammers in the pier foundations of the Washington Bridge, East Providence, Rhode Island. The bridge is 2407 feet in length, built on 18 piers, 14 of which are on timber piles 35 to 50 feet long. One pier is on precast concrete piles 25 feet long. The No. 11-B-2 Hammers drove 1212 piles in the foundation of each of the main piers to a cut-off elevation of about 35 feet below the surface of the water.

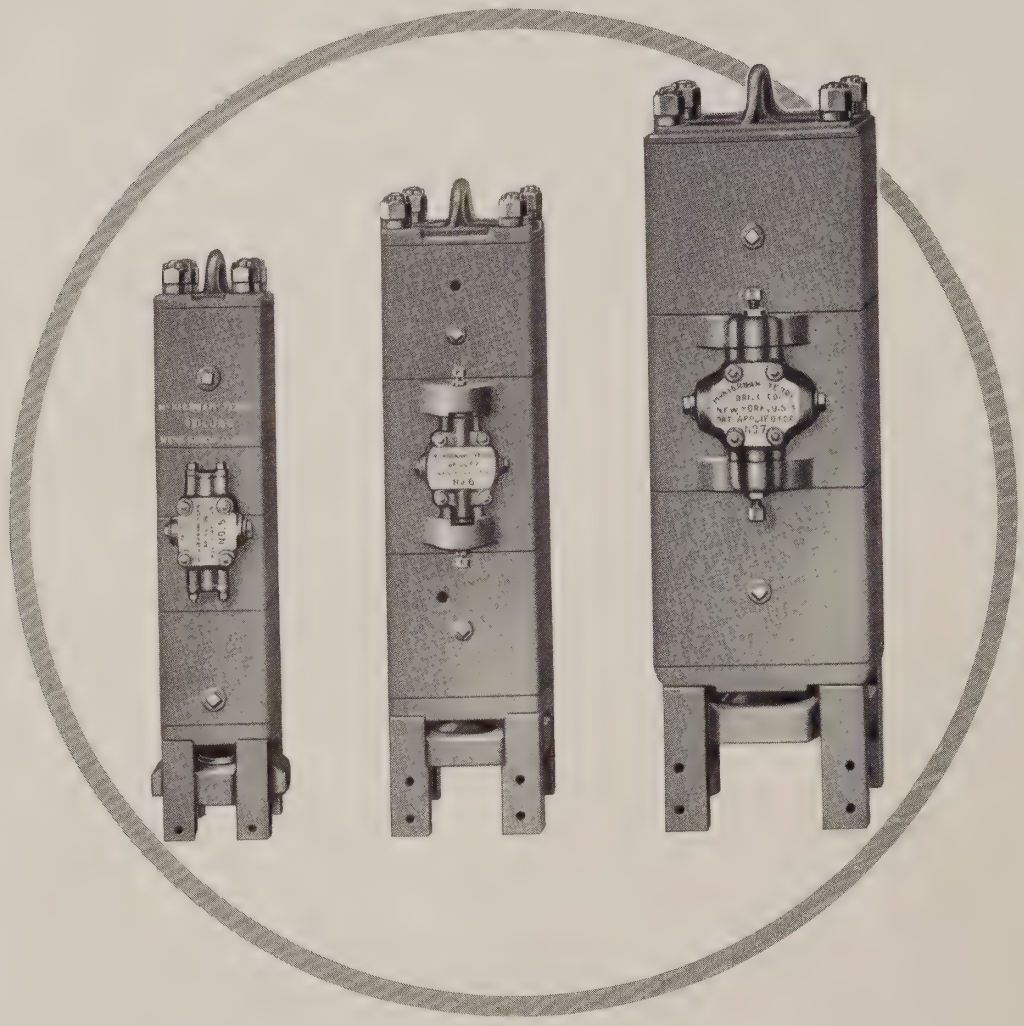
The piles were driven in coarse sand and gravel with occasional pockets of fine sand, clay, mud and shell.

On the deepest pier the contractor drove 37-foot wood piles in 43 feet of water without using a follower. The pile driving crew lowered the telescopic extension of the leads part way into the water, slipped the pile into the leads, pushed the head of the pile under the No. 11-B-2 Hammer, and dropped hammer and leads to start the pile. A wire across the front of the leads prevented the pile from floating out once it had been inserted. For the cofferdam construction, deep-trough section steel sheet piling was driven by the contractor.

The Washington Bridge is a highway structure across the Seekonk River between Providence and East Providence and replaces an older bridge alongside. It consists of a double-leaf bascule span 150 feet long and 12 concrete arch spans.

McKiernan-Terry Pile Hammers show up best when the driving is most difficult.

Medium-Duty McKiernan-Terry Pile Hammers



Weights

No. 5, 1500 lb.

No. 6, 2900 lb.

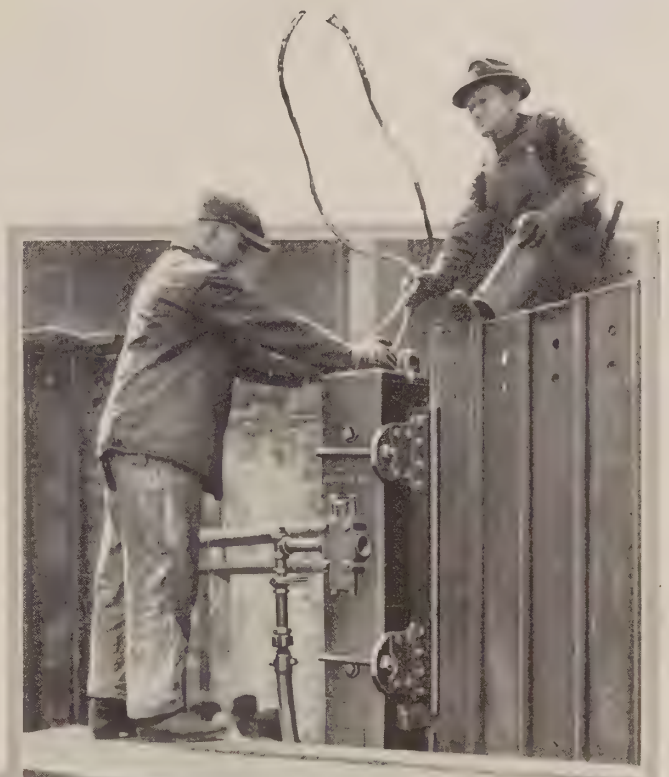
No. 7, 5000 lb.

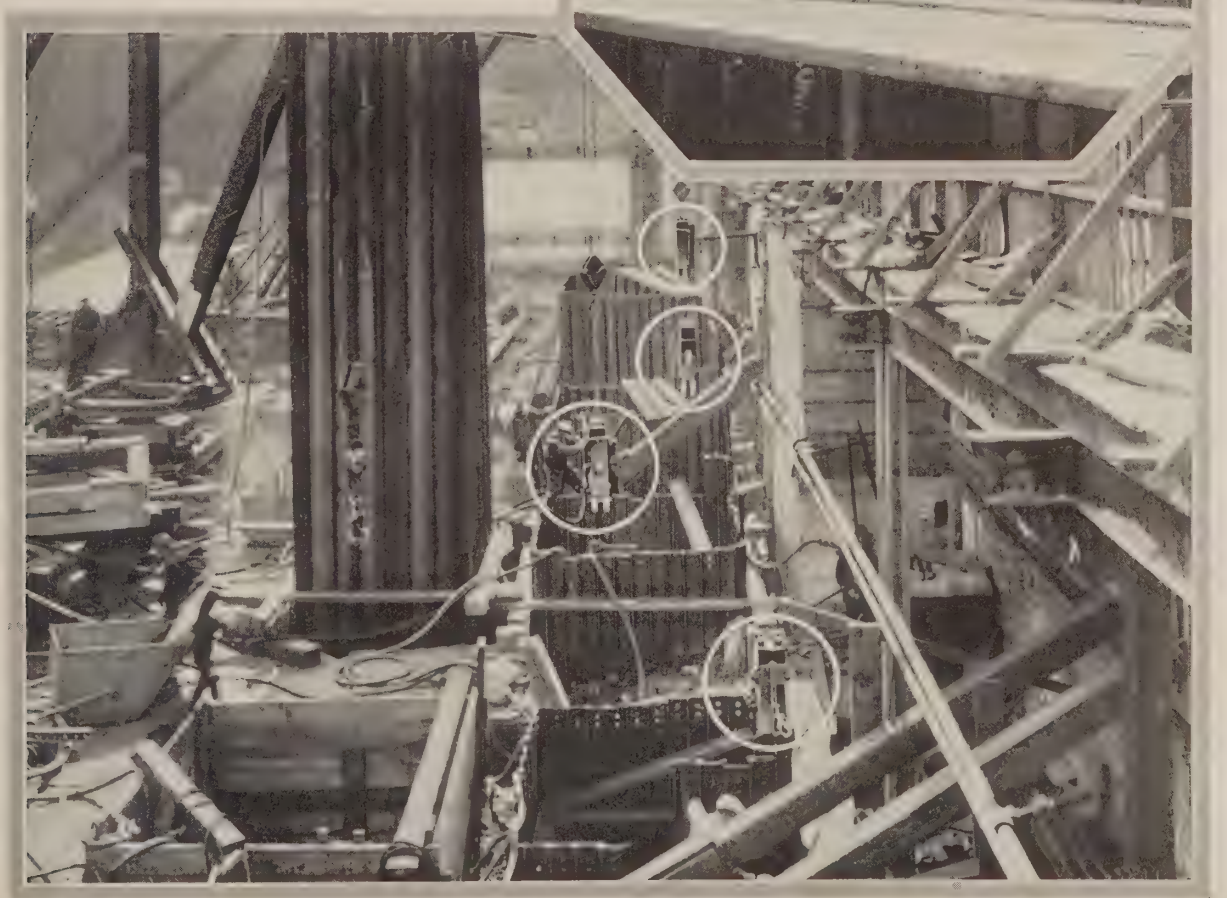
Four No. 5 pile hammers driving cofferdams

THE cofferdams shown in the picture below were used in the construction of the new Savoy Plaza Hotel, New York. They were built of 9-inch steel sheet piling, driven in a fine sand formation. Four McKiernan-Terry No. 5 Pile Hammers were used to drive this sheeting.

The upper picture shows a special attachment employed on this job to permit driving of the sheeting with the pile hammers released from the derrick. With this device, which slides in the pile groove, a firm guide was provided for the hammers, keeping them directly in line with the piling, so that the full force of every hammer blow was delivered on the interlock of the two sheets driven at one time.

For another view of this job see page 69.



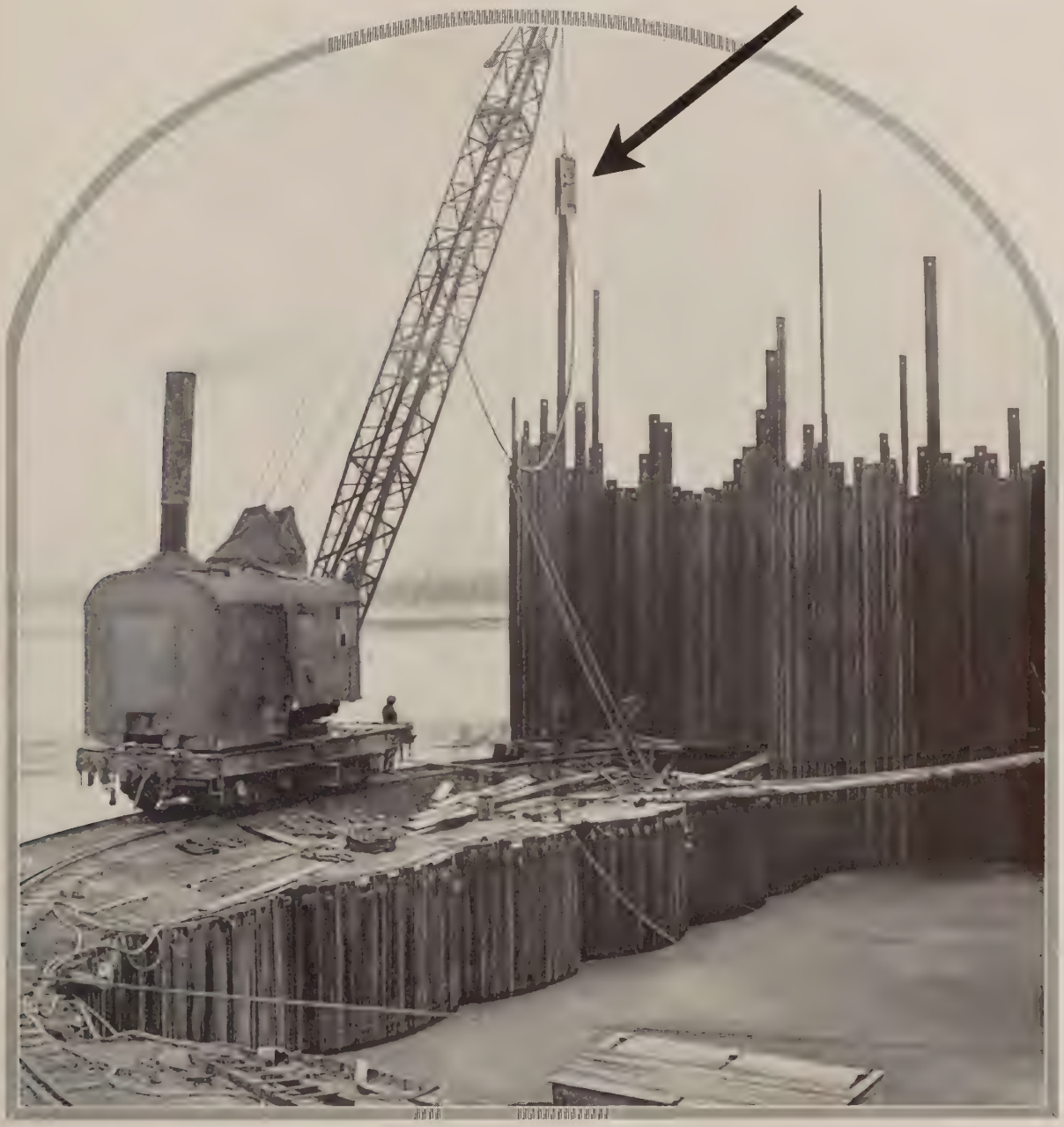


In England—Driving and pulling

McKIERNAN-TERRY No. 5 Pile Hammer driving 12-inch steel sheet piling for a cofferdam preparatory to building oil tanks. This piling was used twice, the same hammer being employed to extract it after each using. Operations of this kind are quite common in England where heavy structures are built on soft ground.

It is one of the advantages of McKiernan-Terry Pile Hammers that often the same hammer can be used for both driving and pulling. The machines which have this "Dubl-Duty" feature are Nos. 2, 5, 6 and 7. It is not necessary to use as heavy a hammer for pulling as for driving, but it can be done if a smaller one is not available.

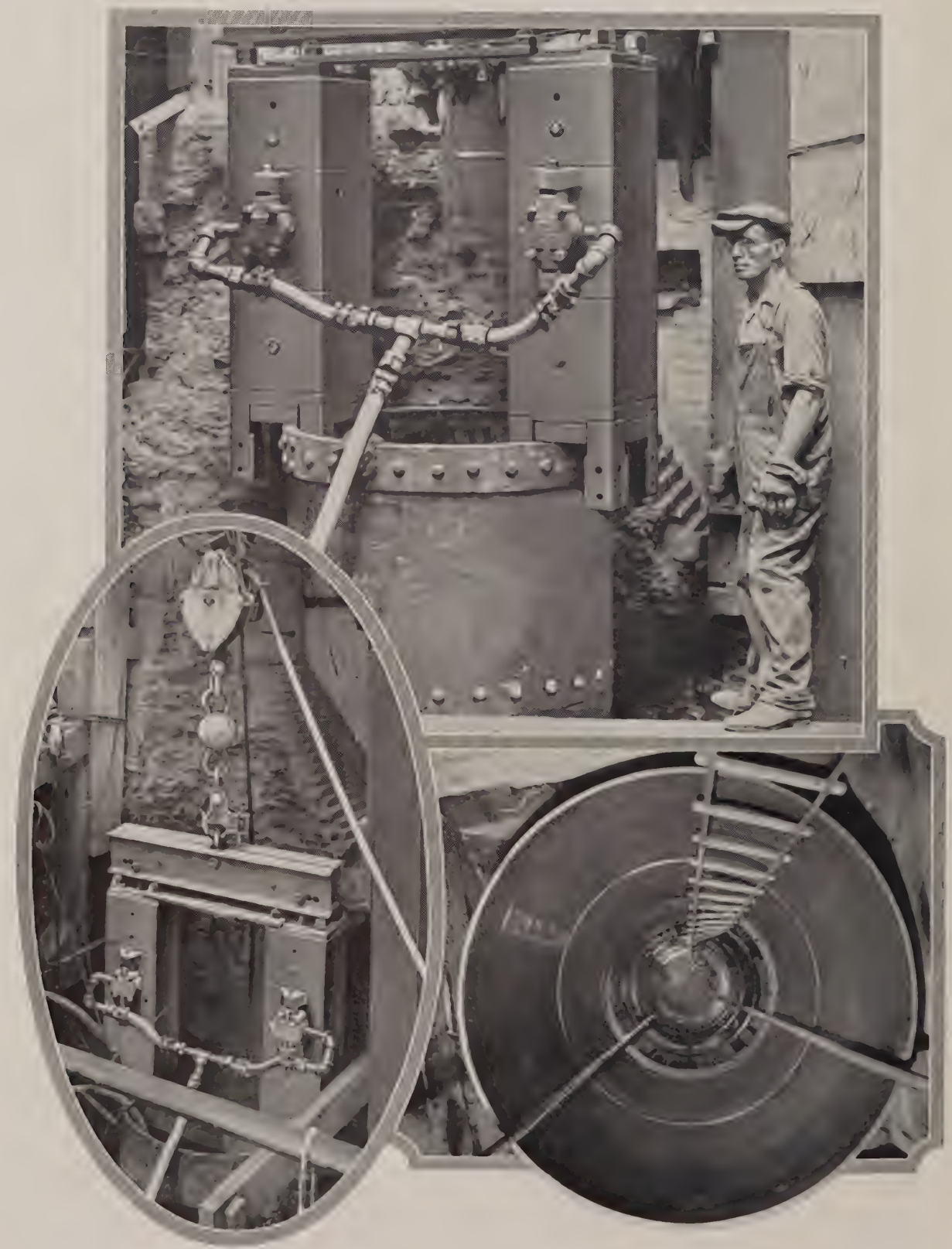
A No. 6 McKiernan-Terry Pile Hammer, weighing 2900 pounds, will pull any piling which requires, for driving, a hammer at least three times its weight.



Driving sheet piles in cells

DRIVING the piles on this job was started after three cells had been completely assembled and closed. The contractor attempted to drive this sheeting with a —— hammer in swinging leads, handled by a 30-ton crane with a 70-foot boom. This crane also carried a 2-inch jet with water at about 80-pound pressure. The —— is a heavy, slow stroke hammer, and the swinging leads made it almost impossible to center it over the piles. After driving about one cell with great difficulty with this hammer it was discarded and a No. 6 McKiernan-Terry Hammer weighing 2900 pounds, with a very rapid stroke, was substituted. This hammer was light and easy to handle with the crane. From this time on there was no particular difficulty, and it was even possible to drive faster than the piles could be assembled.

The record for assembling was 44 piles in a 10-hour shift, while in one shift 85 piles were driven about 42 feet each. All piles were jetted during driving. The steel sheet piles were 48 to 56 feet in length.



Driving 44-inch-diameter cylinders with No. 6 Hammers in tandem

FOR sinking the caissons for the foundation of The Bank of The Manhattan Company Building, 40 Wall Street, New York, the foundation contractors, used McKiernan-Terry Pile Hammers, operated by air, to put down some of the cylinders. In all, six cylinders were driven to 32-feet penetration through sand and hardpan.

Three cylinders were put down by two No. 6 Hammers in tandem. A special driving head was used made up of a short pipe section with reinforcing bands riveted to top and bottom. Both hammers were regulated to strike blows in unison.

At this point solid rock is at an average depth of about 80 feet. The overlying materials consist of sand to an average depth of 44 feet underlaid by hardpan stratum containing a high percentage of boulders. After the cylinders had been driven to hardpan and excavated, the excavation was continued to rock. These cylinders when concreted will carry 800 tons per pier.

McKiernan-Terry Hammers also drove hundreds of smaller pipe piles (see picture below) on this same job.

To save time in erection of the new structure the foundations were put down in the basements of the old buildings while they were being wrecked.

Another picture on page 18 shows a No. 9-B-2 McKiernan-Terry Hammer driving 52-inch-diameter cylinders.

Explosives could not be used because of the proximity of a temporary water line, so the contractor made use of McKiernan-Terry Pile Hammers as shown in the pictures. A special cap was fitted into the base of the hammer to serve as a chuck for supporting a long 4-inch chisel of the bull-point type. With this device the granite blocks and masonry fill were broken out in mass.

The lower picture shows another demolition job.

Demolition with a No. 6 pile hammer

THE upper picture shows a No. 6 McKiernan-Terry Pile Hammer being used to break up masonry in connection with the Baisley Boulevard sewer, Borough of Queens, New York. It was necessary here to remove an old aqueduct, which was 13 feet wide, 10 feet high, and 137 feet long, built of brick and concrete and finished on the outside and top with heavy granite blocks. The masonry was in excellent condition and it was found difficult to remove it with hammer drills.

Using a pile hammer to demolish a concrete building

HERE is another profitable use for McKiernan-Terry Pile Hammers. The pictures show a No. 7 used to demolish a two-story reinforced concrete garage, in New York. It was necessary that the building come down in the least possible time. Ordinary wrecking methods were not fast enough, so the contractor did the work in less time (25 working days), and at a lower cost than originally estimated, by using the McKiernan-Terry Hammer.

An 18-inch length of pipe, 16 inches in diameter, was fastened to the anvil block of the hammer, being held in place by a cable running around the hammer and through holes in the pipe. The curtain walls were demolished by removing the pipe and setting the hammer legs over the walls. At one time the hammer penetrated 12 feet of 6-inch curtain wall in about 6 minutes.

Before adopting pile hammers an attempt was made to demolish the building by dropping a heavy steel ball from a considerable height to the floors. This not only proved ineffective, but the ball bounced to such an extent as to be dangerous. The use of the pile hammer had the advantage not only of rapidly tearing down the building but also of jarring the reinforcement loose so that a few cuts with a blow torch made it available for the junk dealer.

On demolition work—smashing 10-inch concrete slabs

THE wrecking of a masonry and concrete building in Philadelphia had to be done in a stated time. The work began by using hand labor aided by drop weights for breaking the roof slabs. This method was found to be so slow that it was quite evident that the work could not be finished on schedule time, so they substituted No. 6 McKiernan-Terry Hammers fitted at the base with a short length of pipe for breaking purposes. The arrangement in this case was similar to that used on another demolition job which is more clearly shown on page 61. With these hammers the contractor was able to quickly demolish the remaining floor slabs, two of which were 6 inches thick with an additional 2-inch covering of cinder concrete. The ground floor slab, 10 inches thick, was easily broken up.

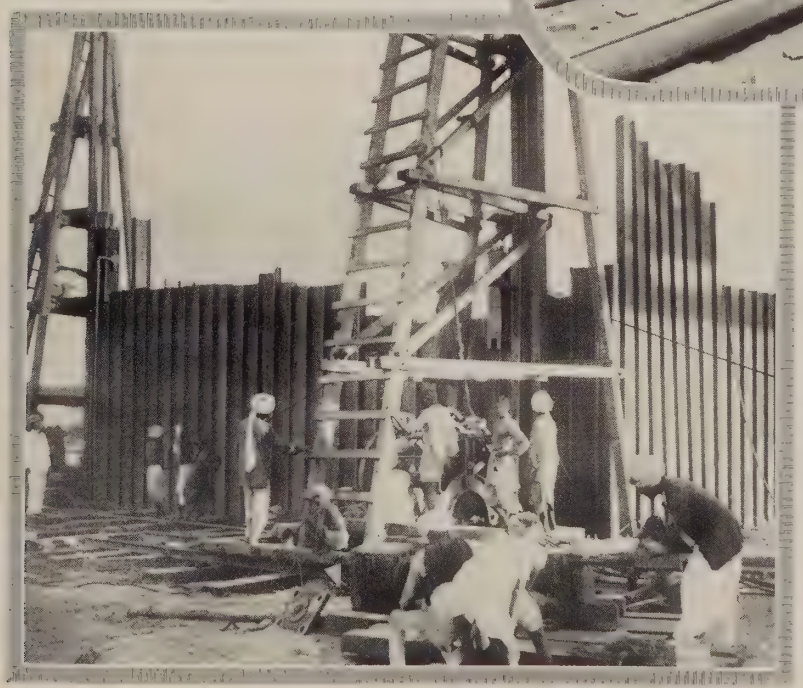
After the pile hammers had broken the bond between the concrete and the reinforcement, torches were used for cutting the rods apart. This left the wreckage in sizes suitable for handling with a steam shovel.

Driving sheet piles in India

IN the lower picture are two No. 6 McKiernan-Terry Hammers, driving 15 x 5-inch Universal steel sheet piling to form a closure around a railroad bridge pier in India. The driving was through fine sand, without jetting, and native labor was used exclusively. This was one of several piers built in the same way, and the steel sheet piling was pulled, after the piers were completed, with the same pile hammers which did the driving.

On such work as this, in countries where only native labor is available, the simplicity of McKiernan-Terry Pile Hammers is especially appreciated.

Contractors all over the world have confidence in McKiernan-Terry Double-Acting Pile Hammers as proven by their numerous repeat orders.



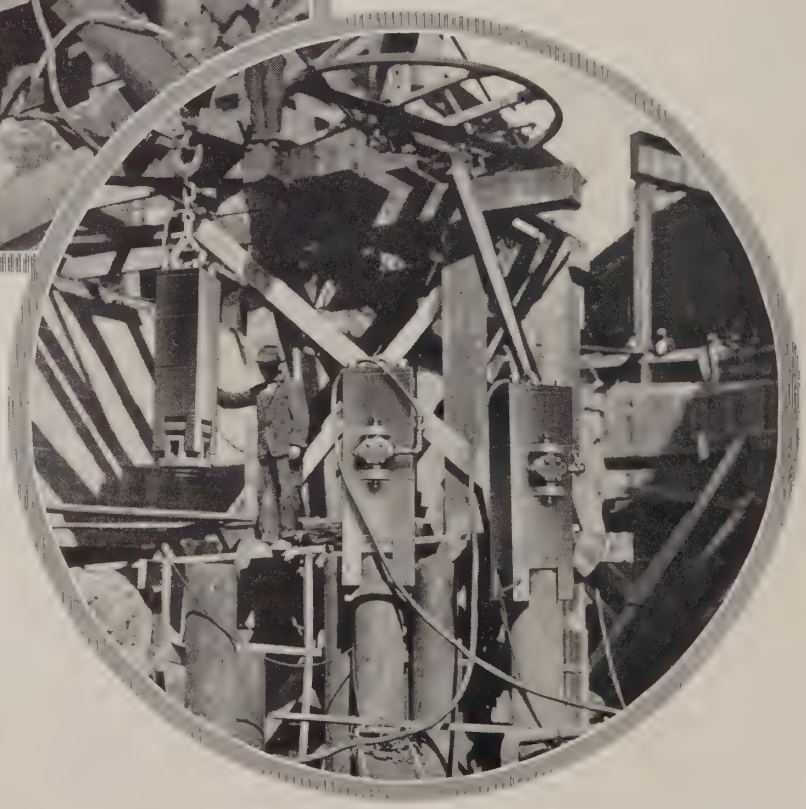
And pipe piles in Newark, N.J.

ABOVE is shown a No. 7 McKiernan-Terry Pile Hammer driving 12-inch to 15-inch pipe piles for the new Prudential Life Insurance Building, Newark, N.J. Eight No. 7 Hammers were used on this pipe pile foundation job.

McKiernan-Terry Pile Hammers driving open-end pipe piles

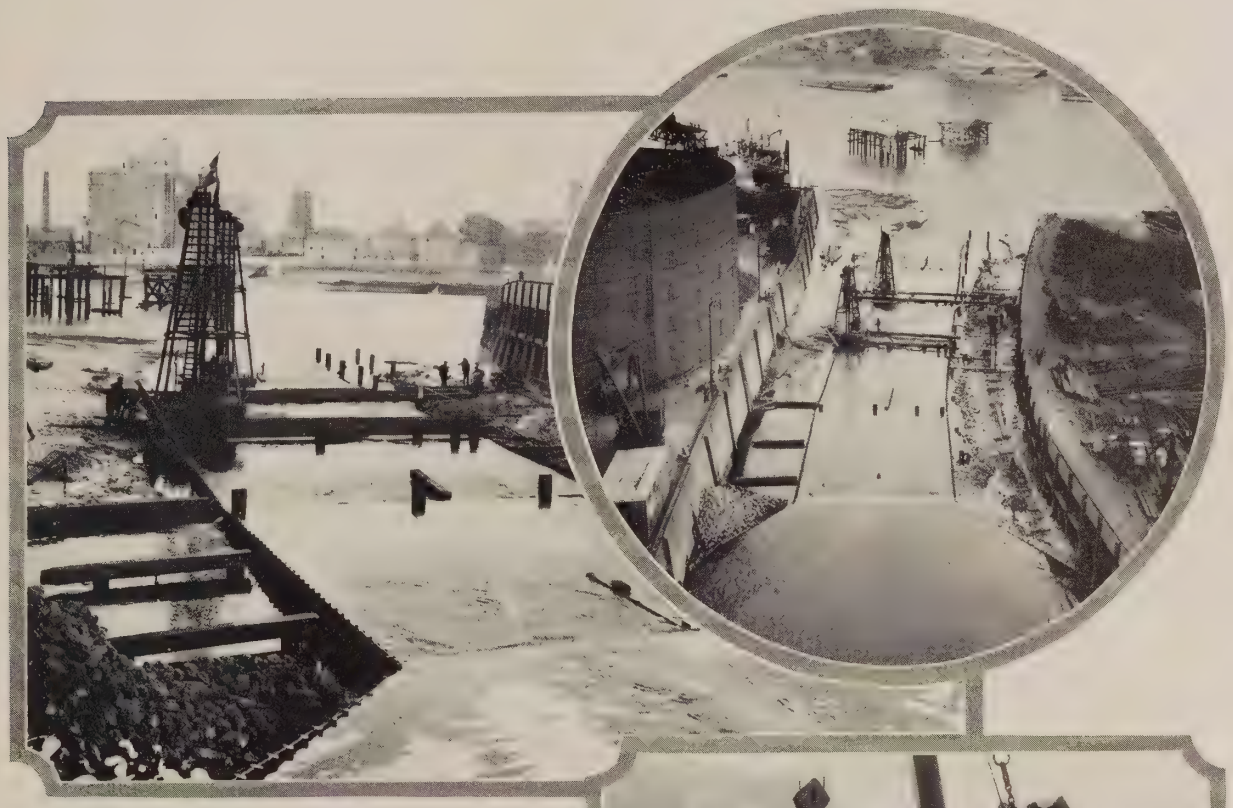
THE lower picture shows one No. 6 and two No. 7 McKiernan-Terry Pile Hammers driving 15-inch open-end pipe to an average penetration of 40 feet. One of the No. 7's drove 547 feet of pipe in 7½ hours with a crew of three men. While this is by no means a record, it gives some idea of the amount of driving of this kind that can be done with the McKiernan-Terry Double-Acting Hammers. About 300 piles were driven on this job. Within six months the same contractor drove ten miles of pipe with McKiernan-Terry Pile Hammers.

This job shows the stand-up ability of McKiernan-Terry Pile Hammers.



Blowing out pipe piles

ABOVE is another picture of pipe pile work, showing a pile being blown out with compressed air. The complete operation consists of setting, driving and cleaning. It is possible by this method to drive large-diameter pipe to great depth. On work of this kind compressed air is commonly used for operating the hammer as well as for blowing out the pipe.

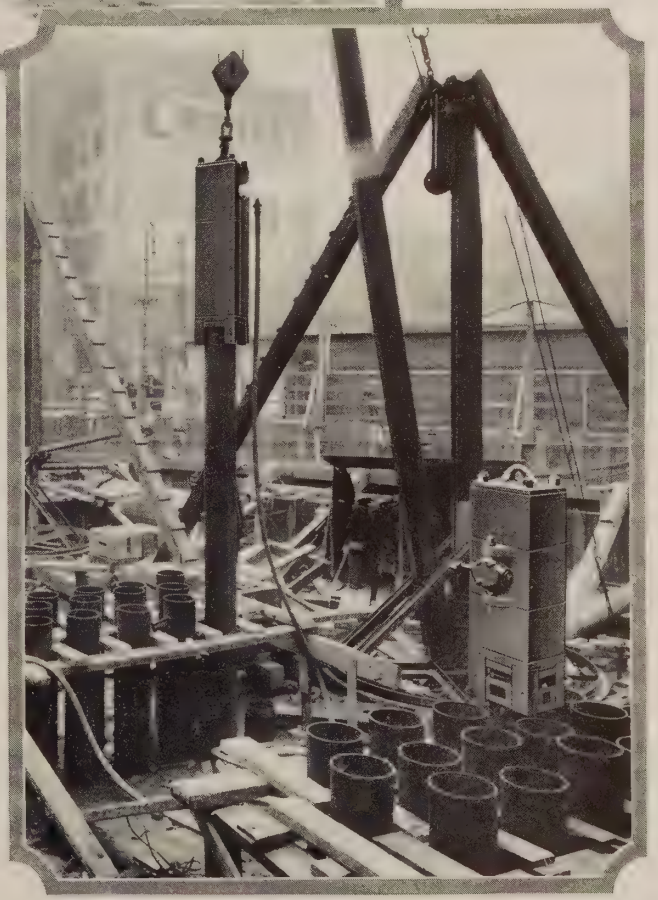


McKiernan-Terry on the job in Chelsea, London

A British Company operated two No. 6 Double-Acting Pile Hammers on this large job. The No. 6 Hammer drove 15-inch by 15-inch steel sheet piling 20 feet long down through mud and hard gravel to clay, working only when low tide permitted.

13,000 feet of 60-foot pipe piles driven in one week

DURING the construction of a new service station for the New York Edison Company, a New York contractor used a No. 9-B-2 and a No. 7 McKiernan-Terry Double-Acting Pile Hammer and drove 13,000 feet of 60-foot pipe piles in one week. The driving was through fill and an old peat bog.



McKiernan-Terry Pile Hammers at work

In Tokyo, Japan

ON the foundations of the great Mitsu Bank Building, a structure built to resist earthquakes, McKiernan-Terry Pile Hammers were used by an American contractor for driving and pulling the steel sheet piling.

All sides of the 350-foot by 160-foot foundation excavation were sheeted with 922 pieces of 35-foot steel sheet piling, driven, pulled and redriven several times. A No. 9-B-2 and a No. 7 did all the driving and a No. 6 pulled the sheeting when the job was finished.

Another No. 7 in England

THE McKiernan-Terry Pile Hammer here is driving heavy steel sheet piling to replace old wood sheeting which has outlived its usefulness. Many miles of similar bank protection work has been done in recent years in England, and McKiernan-Terry Pile Hammers are usually given preference.

Use McKiernan-Terry Pile Hammers on the toughest driving situations encountered.

Cofferdams for concrete piers

THE heavy sections of steel sheet piling used for the cofferdams shown in this picture were driven with McKiernan-Terry No. 7 Pile Hammers.

The coffers were driven to a depth of 40 feet in fine sand. Afterward they were dug out and filled with concrete to form the piers for the steel superstructure of the new Savoy Plaza Hotel, New York. After concreting, the steel sheet piling was pulled with the same pile hammers which drove it.

Several other McKiernan-Terry Pile Hammers were used on this job. See page 55.

McKiernan-Terry Pile Hammers stand hard use because they are simple and well made.

12-inch pipe piles

THE piles shown at the right were 40 feet long, made up of two 20-foot lengths coupled together. When the first length was driven it was cleaned out with a water jet; the second length was then coupled to it and driven with the same hammer, without further cleaning, as shown. Note the special cap used for driving 12 and 15-inch pipe piles. With this attachment the pile hammer rests firmly on the pipe, driving it without upsetting or crimping the top. See page 101.

Eleven No. 7's driving 14-inch pipe

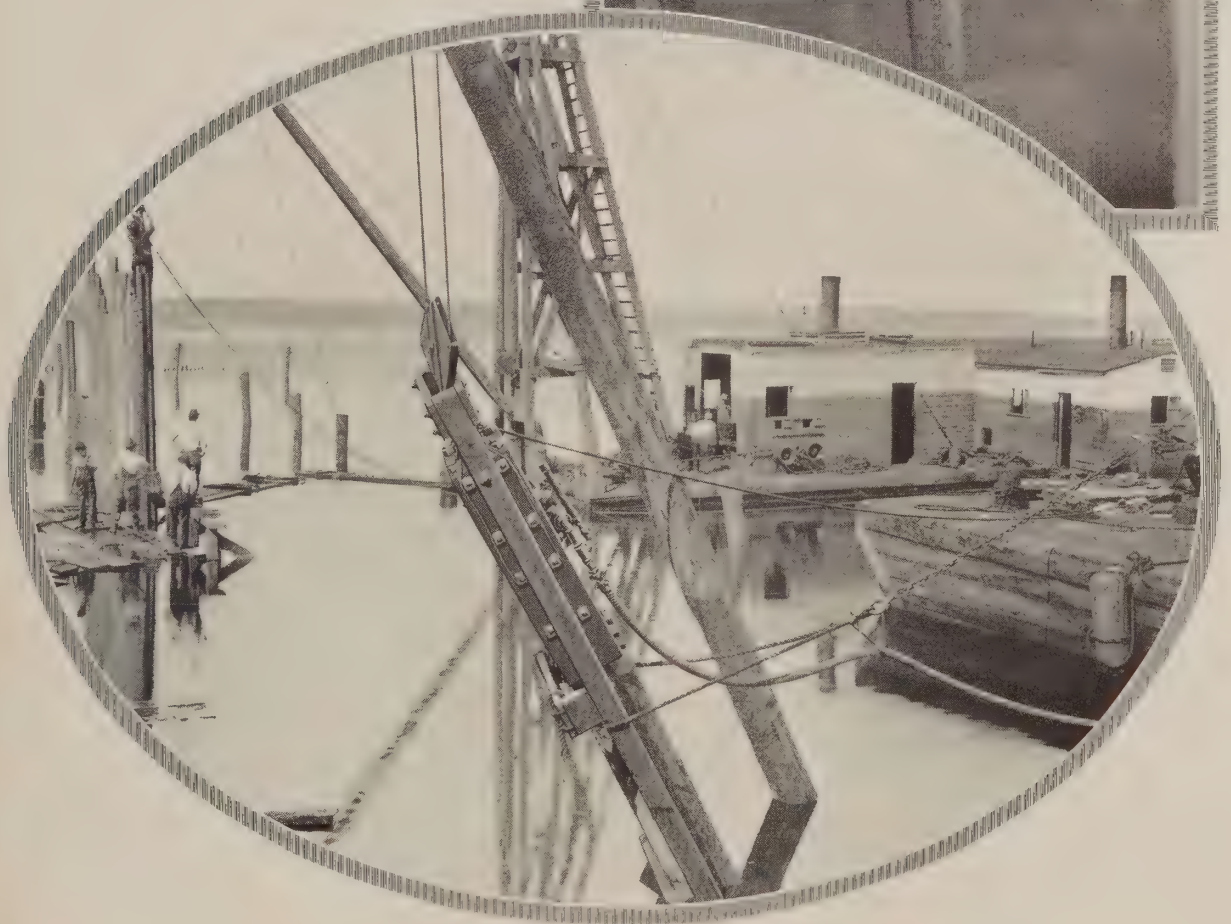
THIS view shows two of a group of eleven McKiernan-Terry No. 7 Pile Hammers used for driving 14-inch pipe piles for the foundation of the Statler Hotel, Buffalo, N.Y. The piles were driven to bed rock in clusters of six to eight, then filled with concrete and all covered with a concrete slab. No pile driver leads are needed for this work, the hammer being supported on top of the pile as shown in this picture and in the oval above. In this way the derrick can leave a hammer on one pile, while placing another hammer on another pile, and so on.

This method of foundation building is becoming more extensive every year.

Long batter piles in hanging leads

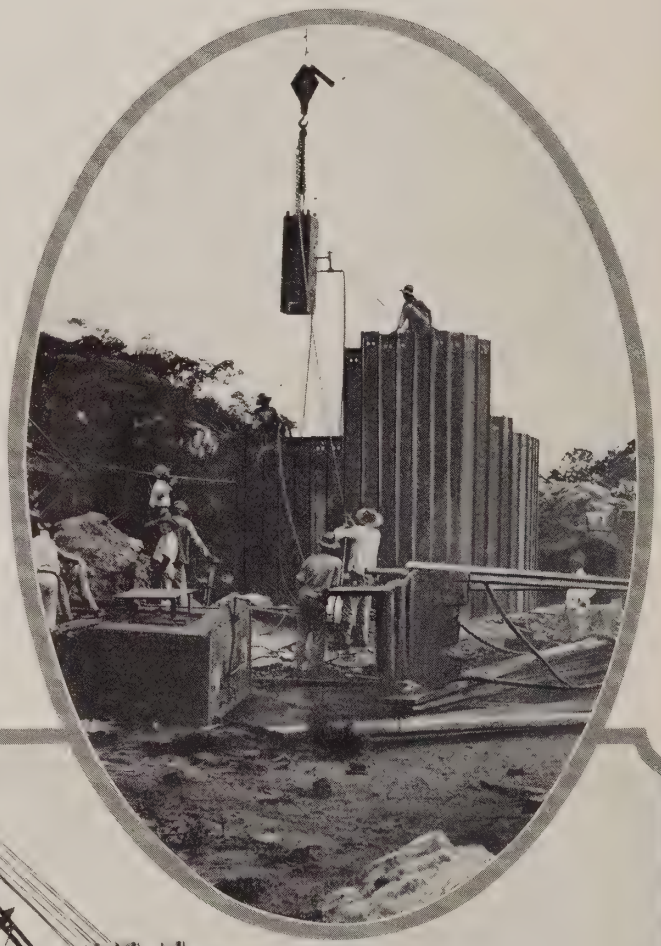
THE foundation piles for this job, in Flushing Bay, Long Island, are 17 to 19 inches in diameter and 80 to 85 feet long. The average penetration, through mud, clay, and mud strata, to bearing in a heavy blue clay, was 55 feet. The swinging leads or guides shown were handled by tackle operated from the end of a 75-foot derrick boom, which was very quickly adjusted to the required position for successive piles. This method of operating was worked out by the contractor and a No. 7 McKiernan-Terry Pile Hammer was used for the work.

McKiernan-Terry Pile Hammers drive batter piling without fixed leads and almost as rapidly as vertical piling.



A big job in Brazil

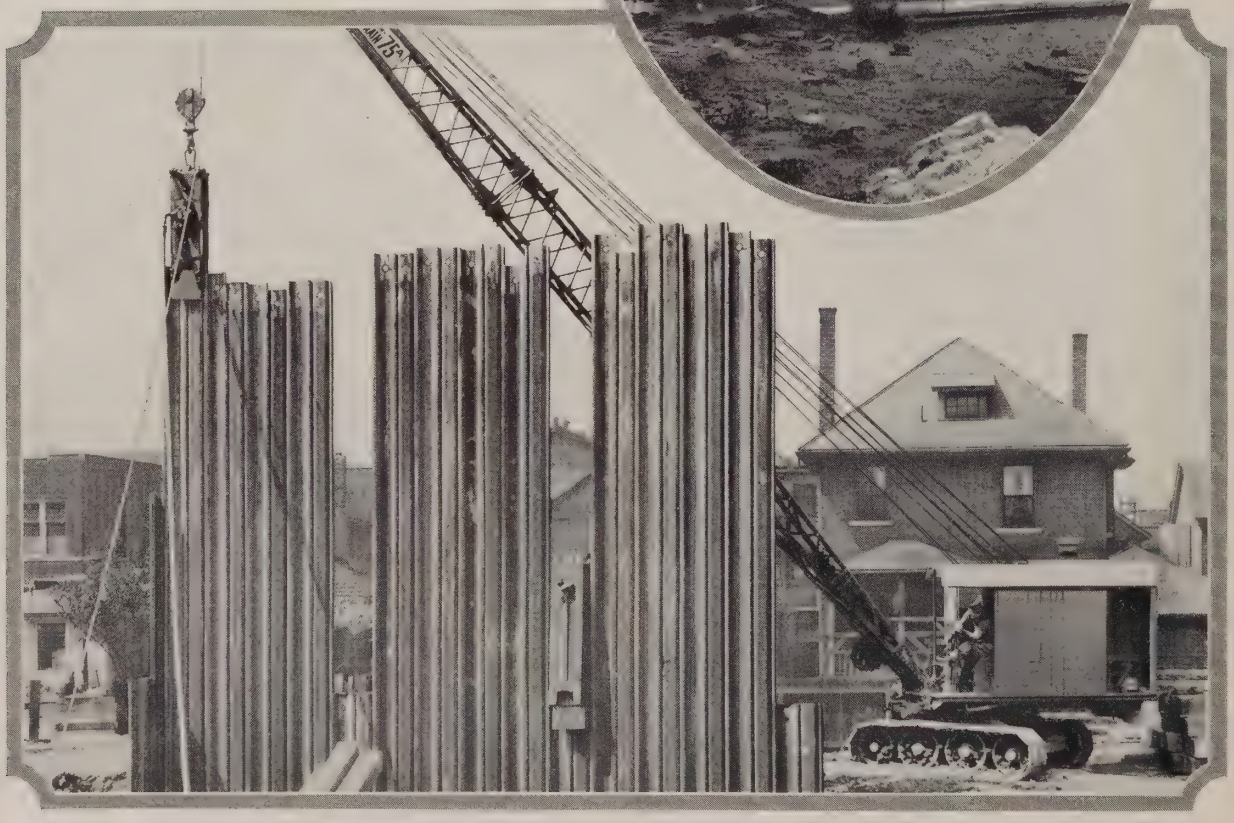
NORTHERN Brazil, in the State of Ceara, is the scene of one of the greatest irrigation projects ever undertaken. Eight great reservoirs have been built by American and English contractors, both of whom used McKiernan-Terry Pile Hammers for the work. The picture (in the oval) shows a No. 7 Pile Hammer driving steel sheet piling as a cut-off to prevent seepage below the footing of a dam.



Another big job, Canada

TWO McKiernan-Terry Pile Hammers shown driving some long steel sheet piles for the Detroit-Canada Vehicular Tunnel, one of the largest projects in that section of the country. The larger hammer shown is a No. 9-B-2 and the other a No. 7.

Almost always found on big jobs, McKiernan-Terry Hammers were again chosen for this large project.



10,000 Tons of sheet piling driven in Egypt along the Nile

McKIERNAN-TERRY No. 7 Pile Hammers were chosen by Sir John Jackson, Ltd., to drive 10,000 tons of steel sheet piling on the Nag Hammadi Barrage along the Nile River in Egypt.

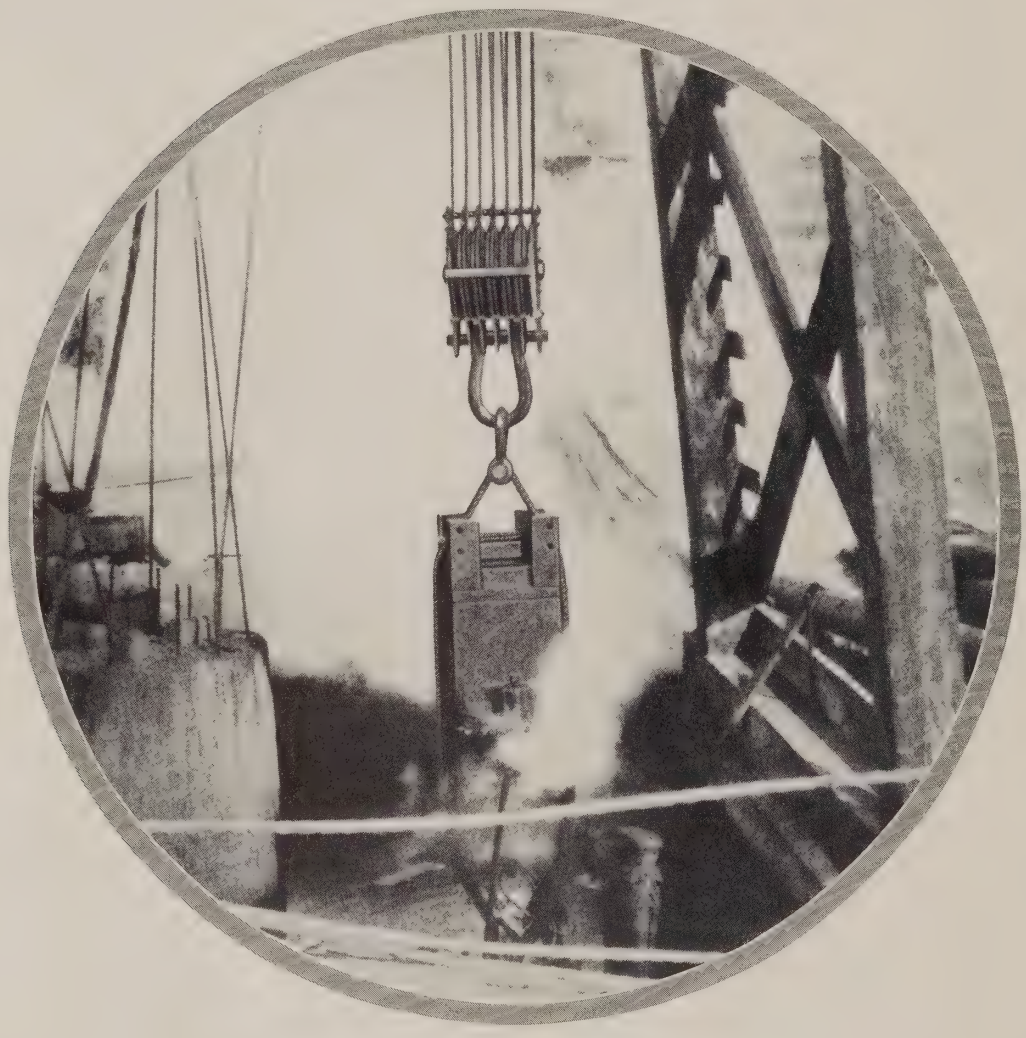
This barrage is a tremendous undertaking. It serves the purpose of counterbalancing the lowering of the Nile River which will result from the Gebel Aulia Dam.

The McKiernan-Terry No. 7 Pile Hammers are operated from pendulum leads on a floating pile-driving plant. The pendulum leads were arranged to travel along a runway which was supported by two pile-driving frames mounted on the pontoon. About fifteen piles were driven, by this means, without moving the pontoon.

After the driving from the pontoons was finished, the frames were moved and erected as self-contained land plants for driving the permanent piling on the drained area. The steel sheet piling ranged from 35 to 40 feet in length and was driven to a penetration of 17 feet; supporting a head of water of 7 feet without bracing.

At the end of the season's work, temporary piling had to be pulled ready for building the dam for the following season's work. Some 5000 piles had to be withdrawn in three weeks. The contractor used a McKiernan-Terry No. 7 Pile Hammer inverted and fitted with pulling attachments to do this important work.

Pile Pulling with Inverted



For Pile Pulling

No. 2 No. 6

No. 5 No. 7

Pile Hammers

CONTRACTORS often write that after trying various equipment and methods on a certain job they have had to fall back upon McKiernan-Terry Pile Hammers to finish the work. More and more users are beginning to realize that it pays to start out with McKiernan-Terry Hammers in the first place, to avoid delays. One contractor wrote that with the McKiernan-Terry Pile Hammer he was driving "from 30 to 50 more piles per day than with a single-acting hammer."

McKiernan-Terry Pile Hammers

WHEN steel sheet piling was first introduced it was only natural that contractors should look about for some method of *pulling* the sheeting after it had served its purpose. It was found that McKiernan-Terry Pile Hammers were the best means of accomplishing this work. Today McKiernan-Terry Hammers (Nos. 2, 5, 6, and 7) are used throughout the world for both driving and pulling.

Various methods of pulling sheet piles by inverting McKiernan-Terry Hammers are shown in this book. It is simply a matter of attaching the inverted pile hammer to the pile and exerting a steady pull upon the hammer by means of a derrick. The force of the hammer blows is thus transmitted to the piling, together with the pull of the derrick line. For attaching the hammer to the pile, either steel straps or wire rope or a combination of both can be used. For average work, wire rope when properly used is least expensive and most satisfactory. See illustration on page 93.

Whatever method of rigging is used, sharp turns should be avoided. A half-round block of wood or iron (preferably the latter) should be placed on top of the anvil block of the inverted hammer, to make an easy turn for the pulling cable or bar which passes around the hammer. It is not advisable to support the hammer by hitching to its four lugs or feet but if this is done the lugs must be braced so that they cannot bend inward towards one another. It is better to have the rope or bands pass completely around the hammer.

Omitting from consideration any piles that have been distorted in driving, the time required to start piles moving, in pulling with an inverted hammer, is about the same as the rate of penetration in driving just before refusal.

A No. 6 McKiernan-Terry Pile Hammer (weight 2900 pounds) will pull any piling which required for driving a hammer at least three times its weight.

A wire rope pulling rig, shown in the diagram on page 93, is made and sold by this Corporation and recommended as preferable to more expensive rigid rigging for the average run of work. It is made up of parts which can be repaired or replaced on the job without difficulty.

It is very easy to attach this rigging to the hammer. A saddle block is provided to fit between the lugs of the hammer, with grooves to keep the cable in proper position. A retaining ring also holds the cable firmly in place between the lugs. Two spliced eyes in the sling at the top are of ample size for any derrick hook. The cable is attached to the pile clamp in such a way as to give all parts the same strain. Holes in the pile clamp plates are 2½ inches in diameter, 8 inches center to center.

This pulling rig is not subject to fatigue failure from vibration, as a rigid steel rig is, and wear on the cables can be seen in ample time for renewal before they are likely to part. This design also enables the operator to lay the pulled pile on the ground without taking another hitch, as the flexible cable permits disengaging the clamp in any position.

No. 6 McKiernan-Terry Pile Hammer pulling sheeting

THE picture at the left shows a No. 6 McKiernan-Terry Pile Hammer pulling 14-inch arch web steel sheet piling. A standard McKiernan-Terry pulling rig was used, as described on pages 75 and 93.

Another view of the same job is shown in the oval picture below. The steel sheet piles were 30 feet long.

This was the same project in which McKiernan-Terry Hammers were used for demolition, as described on page 60.

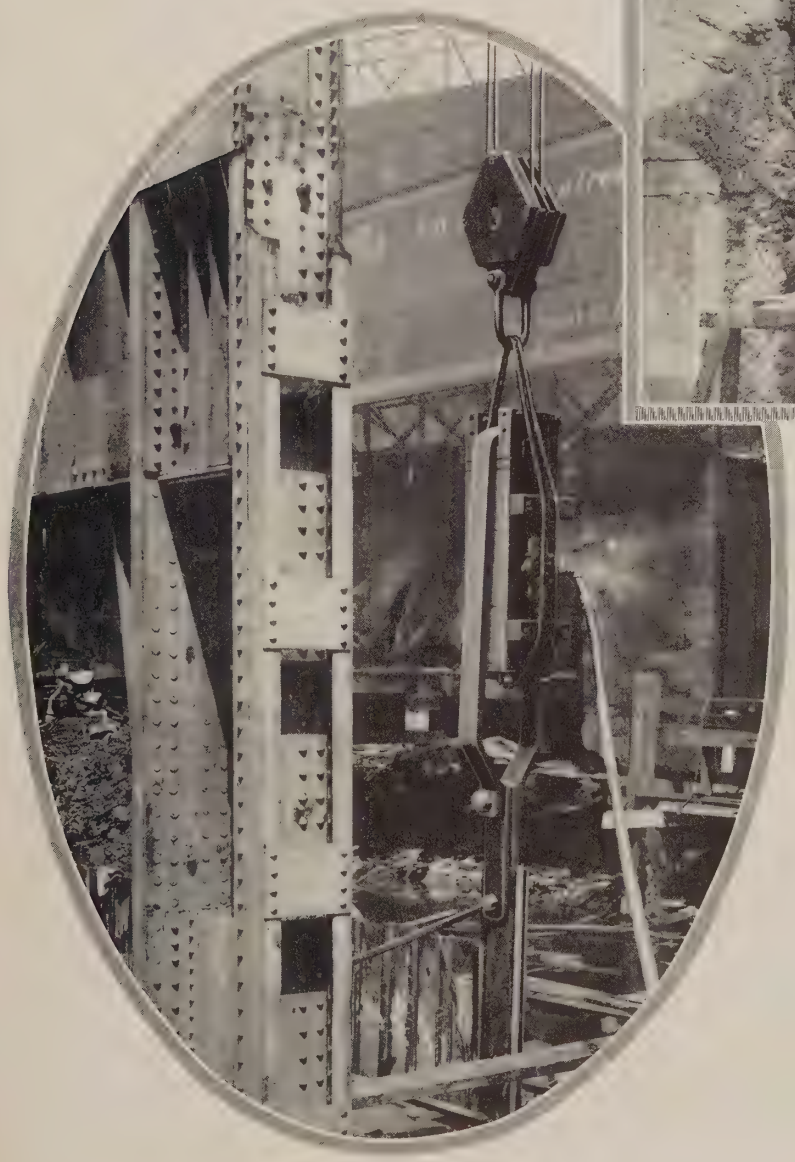
These hammers gave excellent service on this kind of work.

A McKiernan-Terry Hammer is always a big asset to the contractor.

Special pulling rig used in England

THE European method of rigging McKiernan-Terry Pile Hammers for pulling is somewhat more elaborate than commonly used in this country. The rigging shown at the right is made of steel bars attached with grips to the web of the pile.

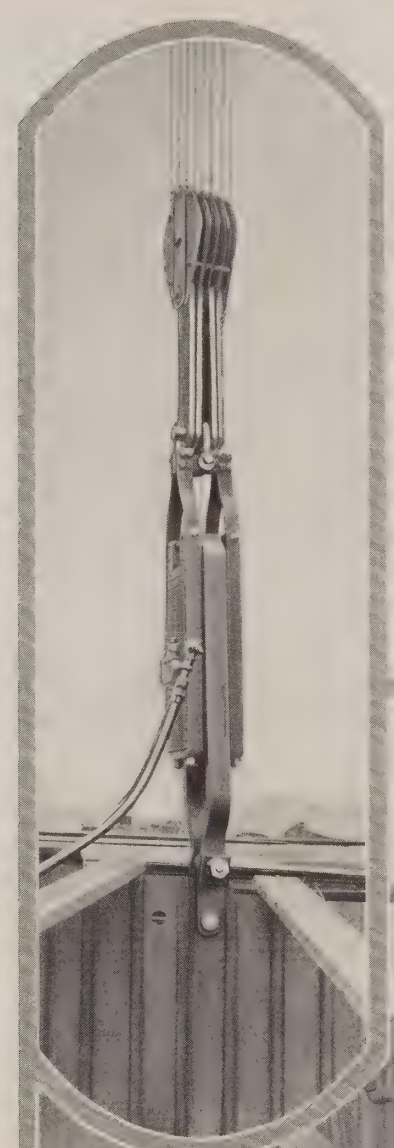
The use of McKiernan-Terry Hammers for pulling as well as driving sheet piles is now common practice throughout the world. Each country has its own special methods but all profit by the same "Dubl-Duty" principle.



Pulling 50-foot sheeting

IN the picture at the left, a McKiernan-Terry No. 6 Pile Hammer is working on the Michigan Avenue Bridge, Chicago. The sheet piling was 50 feet long and was in the river about a year before it was pulled, but the No. 6 extracted it without difficulty.

The "Dubl-Duty" feature of McKiernan-Terry Pile Hammers, whereby the same Hammers can be used for both driving and pulling, has saved many thousands of dollars for contractors by making it possible to use the same sheet piles over and over.

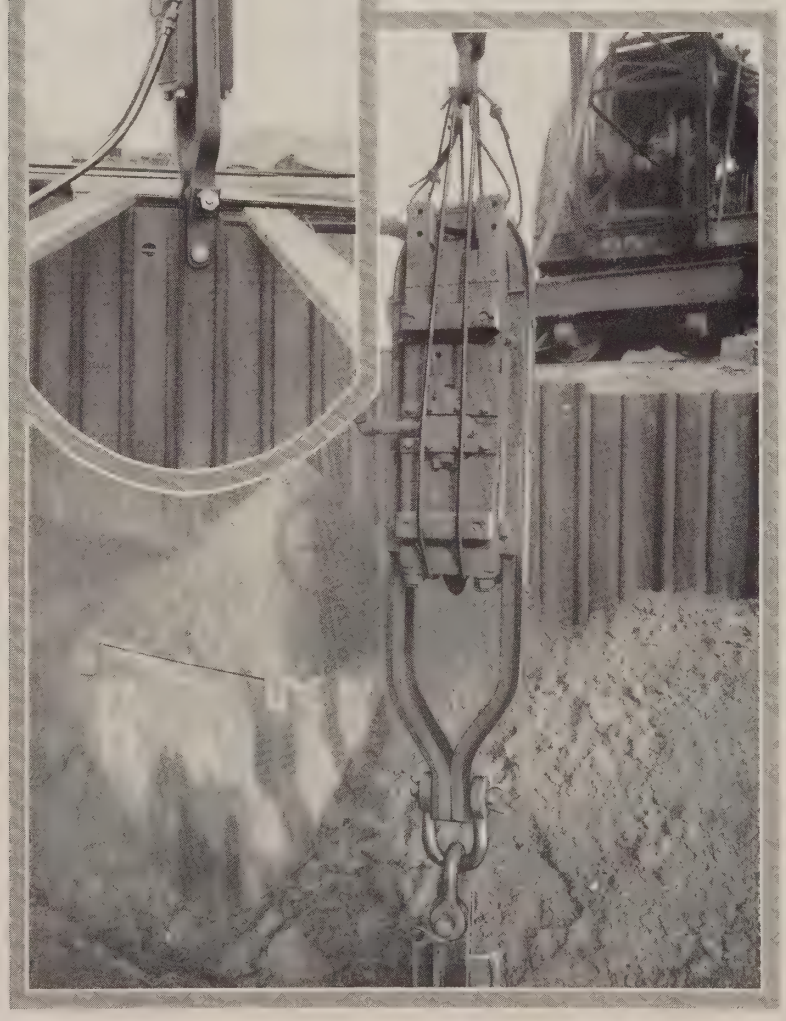


Pulling 3000 tons of sheeting

IN the upper picture are shown some 72-foot steel sheet piles being pulled with a McKiernan-Terry No. 6 Pile Hammer. The hammer was attached to a derrick tackle by means of four long vertical links engaging the lower sheave block and with their lower ends shackled to a horizontal cap piece which had bolted at each end a vertical 4-inch by 1½-inch wrought iron stirrup passing around the hammer and taking bearing on its lower end.

Another stirrup of wrought iron with its loop upwards was made of a bent 6-inch by 3-inch bar having the lower ends upset to provide an unimpaired section with a 4-inch pin through it by which the stirrup was connected to links engaging a 3½-inch pin through a hole burned in the top of the pile.

The hammer was suspended from the boom of a floating derrick equipped with an eight part tackle which exerted an estimated constant pull on the hammer of fully one hundred tons, which was sufficient to submerge the 50 x 110-foot derrick scow 3 feet below normal. On this job over three thousand tons of piling were withdrawn.



No. 6 Hammer pulling 35-foot steel sheet piles

THE lower picture shows an inverted No. 6 Hammer pulling 35-foot steel sheet piles from a cofferdam filled with mass concrete poured to a depth of 5 feet directly against the sheeting with no attempt to prevent a bond. The cofferdams were back-filled to the top of the piling before any pulling was done. The rigging consists of a wire rope sling suspended from the crane hook supporting the inverted hammer. Over the anvil block of the latter was passed a heavy strap of steel, shackled at the lower end to pulling straps pinned to the pile. The contractor said that the piles would not have paid for the trouble of pulling them by any other method.

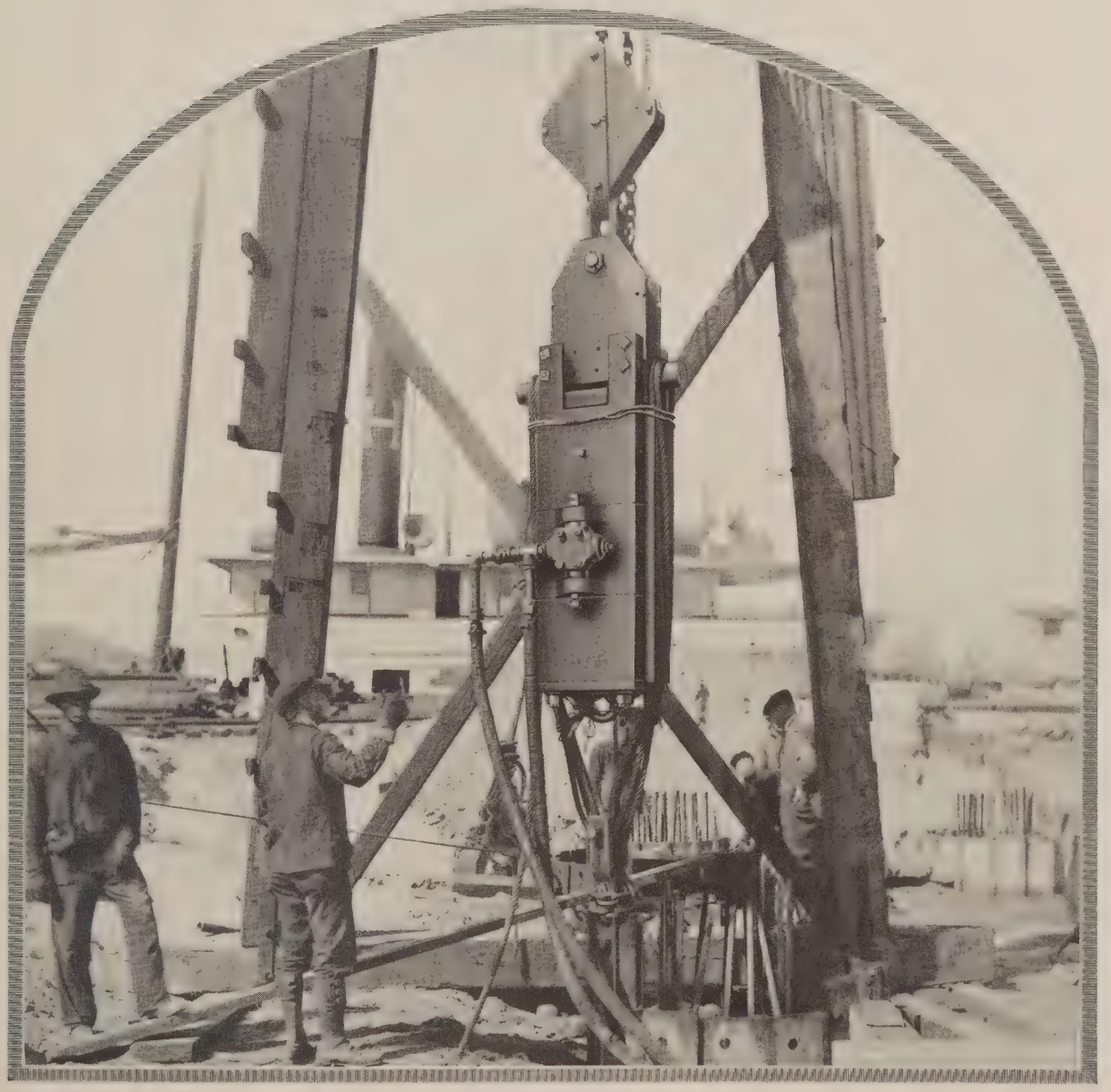
Pulling where other methods failed

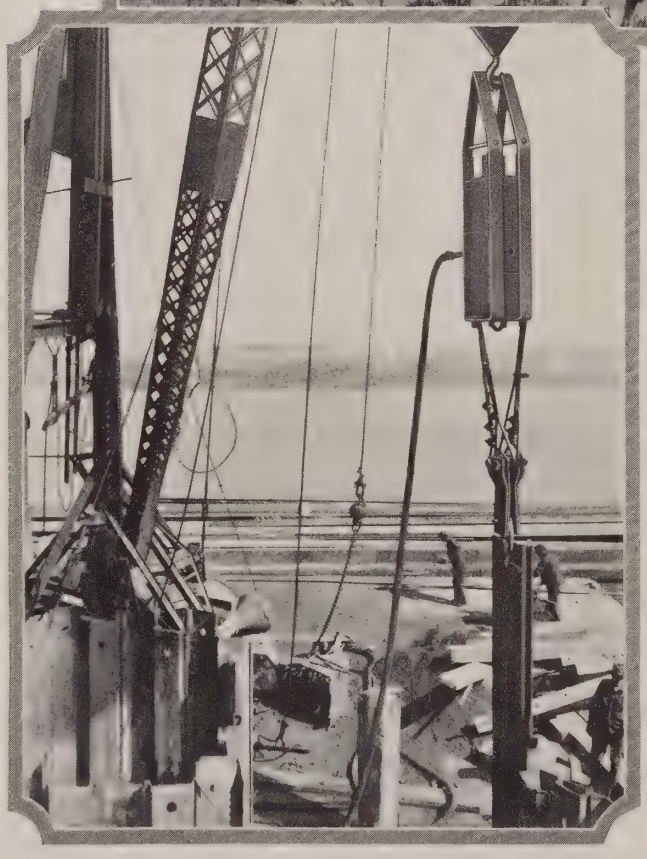
THE method of driving the cofferdams illustrated below, for the foundation of a grain elevator at the Barge Canal Terminal, Oswego, N.Y., is shown on page 20.

The sheet piling was 44 feet long, concreted to a depth of 41 feet, no attempt being made to prevent bonding to the steel. After the work was completed, McKiernan-Terry No. 6 and No. 7 Pile Hammers were inverted and used to pull the sheeting.

This was done only when a derrick exerting approximately 100 tons pull had failed to move the sheeting, after which an A-frame was coupled up with the derrick, exerting 40 tons more, making in all 140 tons pull, which also failed. Then the McKiernan-Terry Hammers were introduced, and, with the use of the A-frame only, they pulled all of the sheeting without difficulty.

A sheet piling expert stated that this was one of the hardest pile pulling jobs ever done.





Pulling sheeting bonded to concrete on Fort Lee Bridge

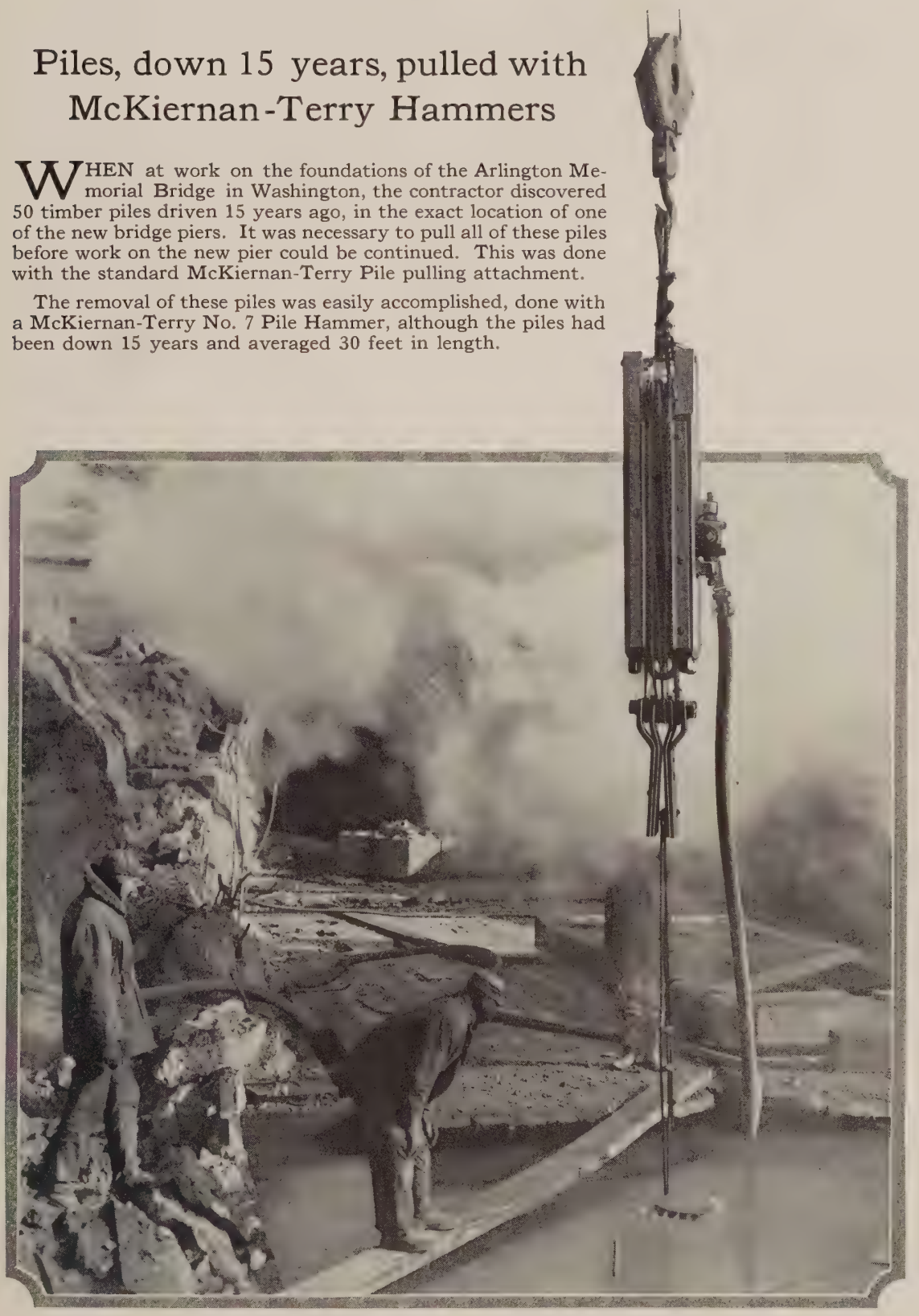
WHEN it came to the difficult pulling of the extremely long lengths of sheet piling on this notable work and after other equipment had failed, a No. 7 McKiernan-Terry Pile Hammer was put on the job to pull the 1600 tons of steel sheet piling from the two New Jersey pier cofferdams on the Fort Lee Bridge across the Hudson River at New York. Some of the 85-foot sheet piles in the partition walls were bonded to 30 feet of concrete on both sides. The contractors inverted the No. 7 Hammer and successfully salvaged all this sheeting. The rapid blows of the inverted hammer pulled the long piles without difficulty. Some of the sheeting smoked as it came out, so tight was the interlock.

For other views of this job see page 7.

Piles, down 15 years, pulled with McKiernan-Terry Hammers

WHEN at work on the foundations of the Arlington Memorial Bridge in Washington, the contractor discovered 50 timber piles driven 15 years ago, in the exact location of one of the new bridge piers. It was necessary to pull all of these piles before work on the new pier could be continued. This was done with the standard McKiernan-Terry Pile pulling attachment.

The removal of these piles was easily accomplished, done with a McKiernan-Terry No. 7 Pile Hammer, although the piles had been down 15 years and averaged 30 feet in length.



"Nothing but a McKiernan-Terry Hammer could pull us through"

SO wrote the Torson Construction Company, Kansas City, Mo., concerning a pulling job handled with a No. 7 McKiernan-Terry Pile Hammer on a sewer contract.

Their letter is an interesting endorsement of McKiernan-Terry Pile Hammers:

"At present we have five of your hammers. We find them much more satisfactory than any hammer used before. We have two No. 5's, two No. 7's and one No. 3. All of which we work daily, including Sundays and holidays.

"The upkeep on these five hammers, over a period of a year, has been practically nothing. What few parts have been necessary to replace (steel balls, springs and pulling plugs) are very small items and have caused us no delay or expense whatsoever. The fact that they can be delivered by mail eliminates time lost waiting for parts to be delivered by freight.

"The hammer in the photograph is one of your No. 7's, pulling 14-inch arch-web steel sheet piling. These piles are from 36 to 40 feet in length and are driven in every kind of soil imaginable. They are driven to a depth of from 30 to 40 feet, and under some of the conditions we have had to contend with we believe we can honestly say that nothing but a McKiernan-Terry Hammer could pull us through.

"For pulling or driving the McKiernan-Terry Hammer rates A-A-A-1 with us."

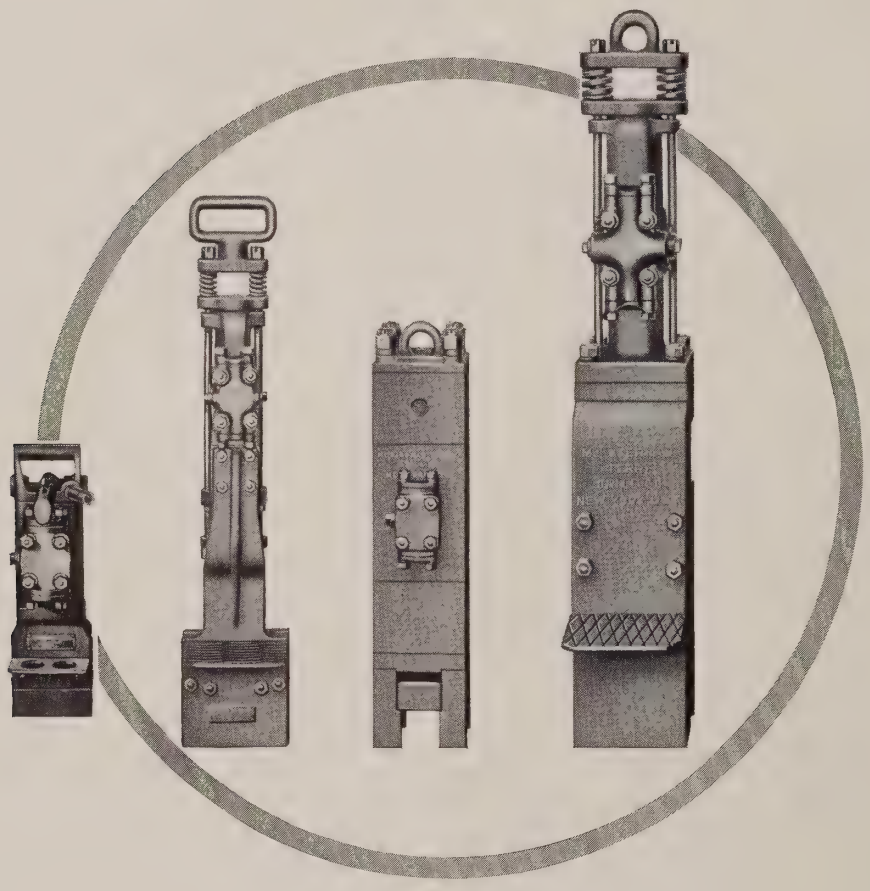
McKiernan-Terry No. 7 pulling forty cofferdams

AFTER driving 46 cofferdams composed of 54-foot arch-web steel sheet piling with a McKiernan-Terry Pile Hammer, the contractor pulled 40 of these cofferdams at the completion of the job with a McKiernan-Terry No. 7 Pile Hammer.

The cofferdams had 12 to 15 feet of concrete in them. The steel sheeting was bonded to the concrete, but the McKiernan-Terry No. 7 Pile Hammer pulled the sheeting without any difficulty. The hammer was rigged on a heavy A-frame and equipped with a pulling yoke and eight parts of line.

The construction job was on the foundations of the Matanzas River Bridge, St. Augustine, Florida.

Light-Duty McKiernan-Terry Pile Hammers



THE picture at the left shows the new No. 0 McKiernan-Terry Pile Hammer. This little machine, weighing 95 pounds, can be handled easily by one man, without the aid of a lifting or supporting device. Like the Nos. 1 and 3 Hammers, No. 0 has a flat back, free from any projections which would interfere with work in close quarters. These hammers (Nos. 0, 1 and 3) will drive sheeting within ¾ inch of a wall or a second course of sheeting.

Weights

No. 0, 95 lb.

No. 1, 145 lb.

No. 2, 343 lb.

No. 3, 675 lb.

Fast work driving timber sheeting

THE contractor used McKiernan-Terry No. 0 and No. 1 Pile Hammers to drive all the wood sheeting on this sewer contract in Great Neck, Long Island.

On the job 7000 feet of 2-inch by 8-inch wood sheeting 25 feet to 32 feet long and 5000 feet of wood sheeting 25 feet to 42 feet long were driven through sandy loam with stone, sand and gravel with clay mixture. The maximum penetration with the No. 0 was 2 feet with the sheeting moving 1¼ inch per minute.

The No. 0 drove an average of 180 pieces of 2-inch by 8-inch by 20-foot wood sheeting (maximum penetration 2 feet) and was followed by two No. 1 Pile Hammers which carried the sheeting to the final penetration.

McKiernan-Terry No. 2 Hammers driving sheeting

THIS would have been a big job if the work had been done with hand labor, using mauls to drive the timber sheeting. In modern construction little of this work is done by the old slow method. On this job two McKiernan-Terry No. 2 Pile Hammers drove all the sheeting in jig time and the job as a whole advanced rapidly because of their use.

These No. 2 "labor savers" are also adapted for pulling piles and sheeting as well as driving, in this way much of the timber sheeting can be reclaimed at very low cost.

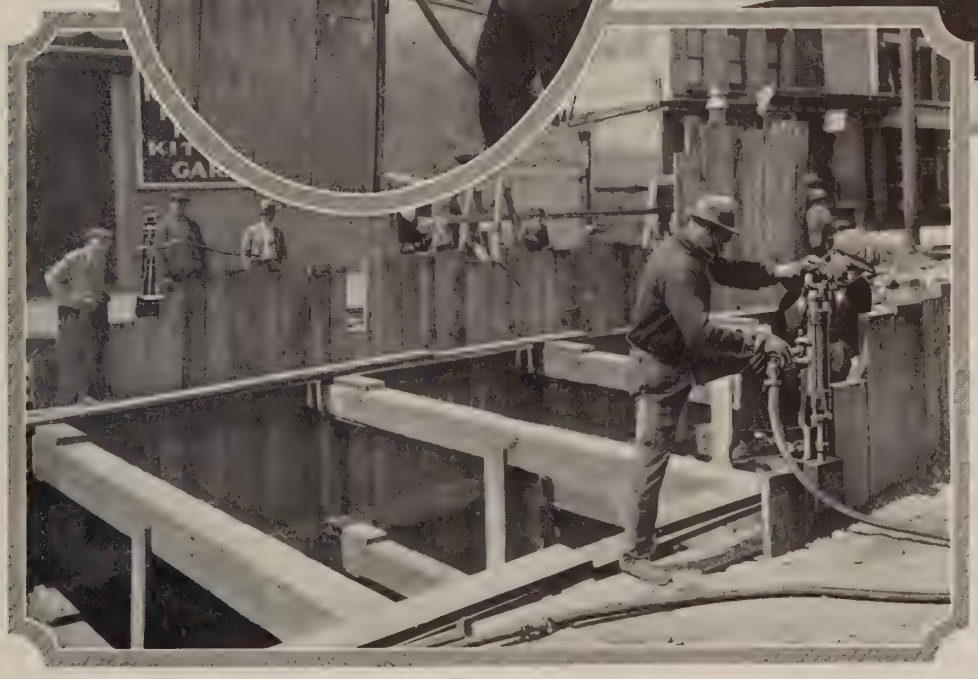
McKiernan-Terry Pile Hammers drive wood sheeting without splitting or brooming the tops.

Like all McKiernan-Terry Double-Acting Pile Hammers these little hammers operate as well with compressed air as with steam.

Fifteen "Labor Savers" on a single job

THE pictures on this page show various jobs where little No. 1 Pile Hammers were used to good advantage. The hammer shown in the lower right-hand corner was one of fifteen used on a sewer contract in Brooklyn, N.Y.

A large number of these "labor savers" are being used throughout the world, each one displacing several men with mauls and doing the same work quicker and cheaper.



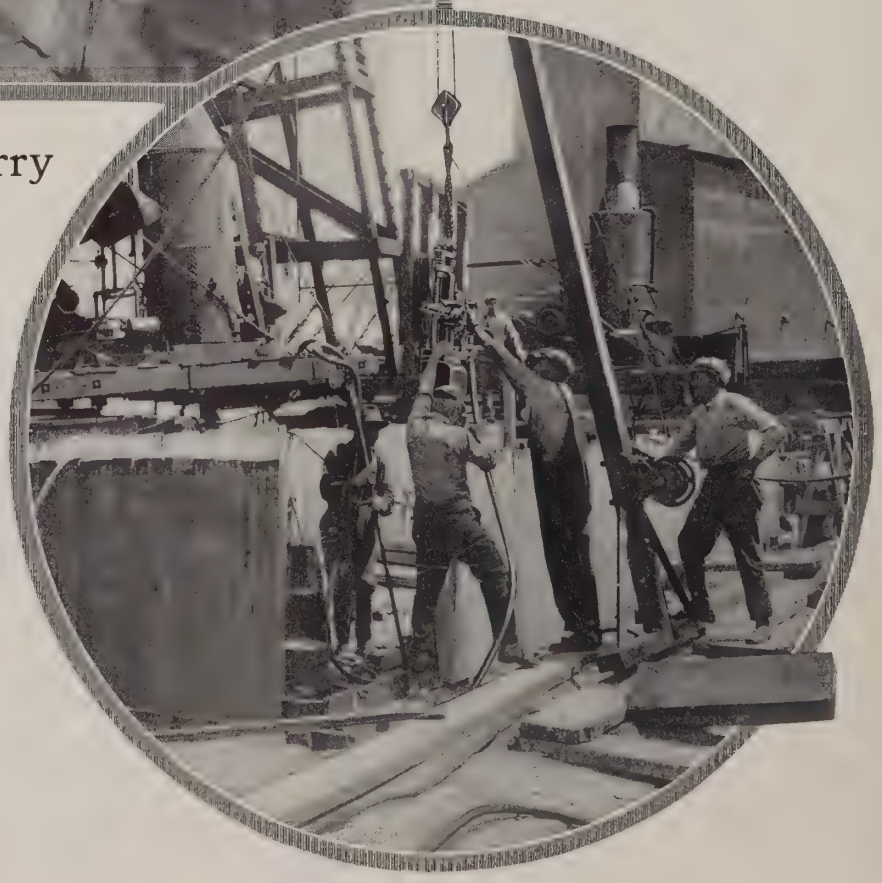
Six miles of wood sheeting

THE picture at the left shows a sewer job at Longview, Wash. This sewer is twelve miles long, and six miles of it was sheeted and excavated. The six miles of wood sheet piling was made up of 3-inch x 12-inch x 16-foot planks, driven with McKiernan-Terry No. 3 Pile Hammers to penetration of 12 feet in coarse sand. A No. 1 McKiernan-Terry Hammer on the same job drove 2-inch x 8-inch x 12-foot sheeting to 8-foot penetration in the same material.

The top of the wooden sheeting was in such good condition after it had been pulled, that little, if any, sawing had to be done to the tops for redriving.

McKiernan-Terry "Labor Savers" on foundation work

THE picture at the right shows a No. 3 McKiernan-Terry Pile Hammer being used for driving wood sheeting to 12-foot penetration through water-burdened sand into clay. This work was on the foundation for a thirteen-story warehouse in Chicago.

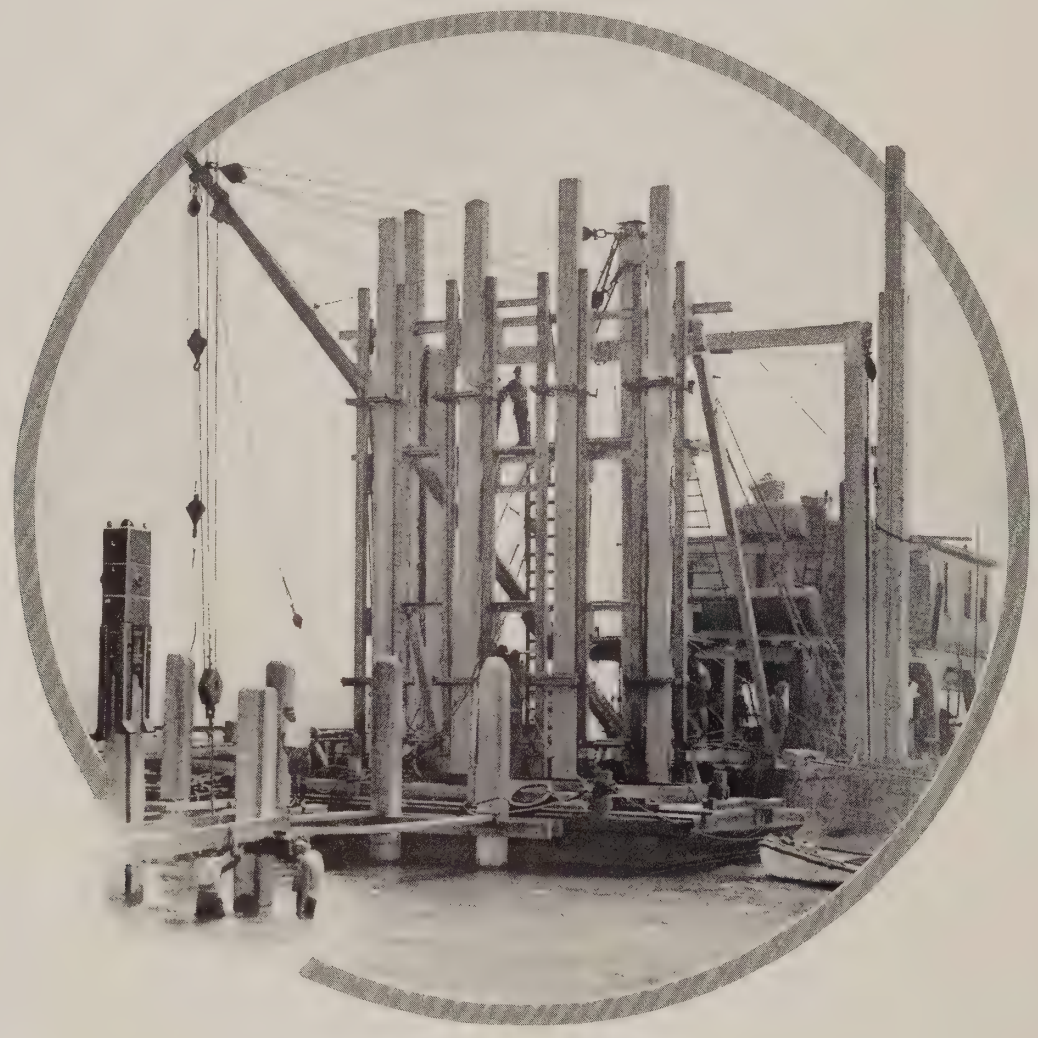


McKiernan-Terry Hammers in England

THE upper picture shows a No. 3 McKiernan-Terry Pile Hammer driving steel sheet piling for the foundation of a large oil storage tank on the banks of the Thames. The tank is 120 feet in diameter and the piling was driven to form a complete ring around the foundation and thus prevent soft ground from spreading under the weight of the tank and its 12,000 tons capacity.

Below are shown two No. 3 Hammers, used on a trenching operation, driving 3-inch wooden sheeting.

General Information



THIS Corporation recognizes its obligations to users of McKiernan-Terry Pile Hammers, wherever they may be, and is keenly interested in all the machines it has ever sold. This interest is reflected in the desire to be of real service to customers, both in supplying new material promptly and in offering suggestions and assistance with a view to improving pile driving methods.

The Corporation's long experience and consequent fund of varied information is available to all who may desire to use it. All inquiries will be given prompt attention.

General Information

ALL McKiernan-Terry Pile Hammers are double-acting; that is, the motive power (steam or compressed air) not only lifts the driving ram but also accelerates the down-strokes with such force that every blow has several times the driving power that gravity alone would give. Piling is driven faster with a double-acting hammer than with any other type. The rapid, powerful blows (even in the largest hammer, two per second) keep the pile in constant motion, reducing inertia, friction, and point resistance, and insuring faster driving than with a hammer which depends upon gravity alone.

McKiernan-Terry Pile Hammers can be operated with either steam or compressed air. A change from one power to the other can be made without adjustments of any kind.

Simplicity, compactness, durability, and fewer moving parts than any other pile hammer, are characteristic of McKiernan-Terry construction. All moving parts are entirely enclosed, cannot injure the operator in charge, and are protected from disarrangements which might otherwise be caused by accidental exterior damage.

McKiernan-Terry Pile Hammers need no special form of cap for driving timber piles, wood sheeting or straight web steel sheet piling, but for the deep trough sections of steel sheet piling, or for pipe piles, special base attachments are desirable.

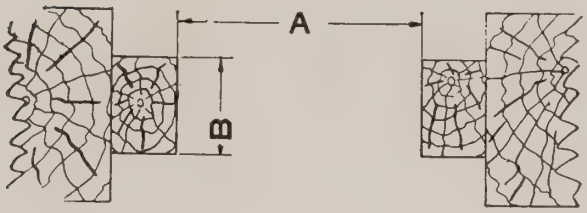
Diagrams showing different methods of holding a pile hammer in alignment with the piling will be found on page 101.

Selecting the proper size hammer

BUYERS sometime make the mistake of selecting a pile hammer too light for the work to be done. When extra weight is not a disadvantage it is always recommended that the hammer selected be large enough to drive the piling in harder material than is anticipated. The weight of the hammer required should be determined not only on the basis of soil resistance, but also on the weight of the individual piles to be driven. The pile itself will absorb a part of the energy of the blow and the hammer should have enough weight to ensure a surplus force sufficient to keep the pile in motion. It is not possible to give in this book accurate estimates of the driving capacity of pile hammers, owing to the diversity of materials to be penetrated, but the information on this subject given in the table on page 98 is the result of actual observation and will be of assistance in selecting a pile hammer of the proper size.

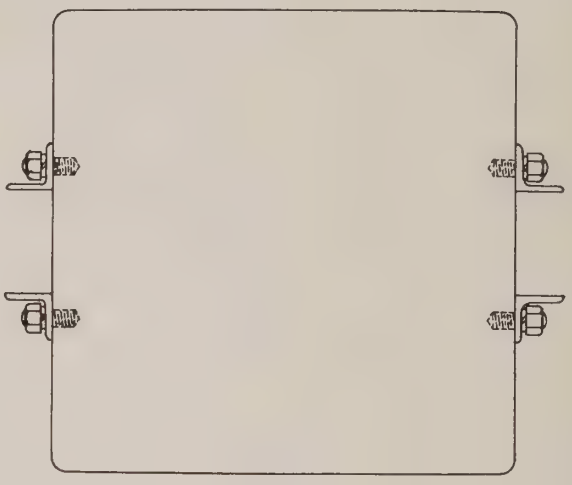
When ordering pile hammers with angle iron guides attached for operation in pile driver leads, be sure to specify measurements "A" and "B" as indicated in the drawing on page 92. No charge is made for attaching angle iron guides for standard leads.

If holes are to be drilled for angle irons, or any other attachment, they should not be located nearer than 2½ inches from the edge of the hammer, and no holes should be drilled deeper than 1½ inches.

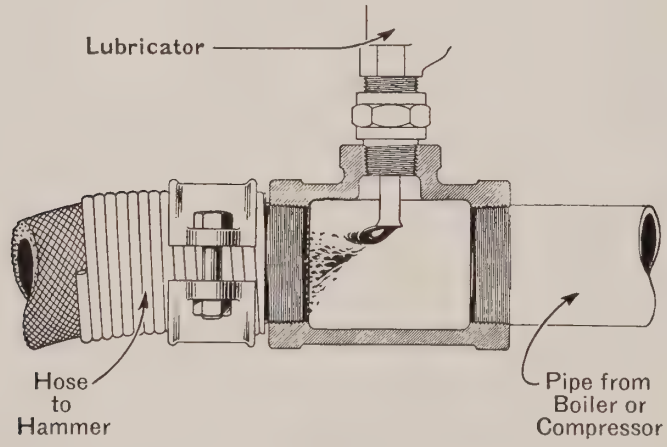


Attaching angle iron guides

Hammer	Size of Stud	Depth of Tapping	Number Required
No. 5	3/4"	1"	16
No. 6	7/8"	1 1/4"	12
No. 7	1"	1 1/4"	16
No. 9-B-2	1"	1 1/4"	20
No. 10-B-2	1"	1 1/4"	24
No. 11-B-2	1"	1 1/4"	24



McKiernan-Terry Pile Hammer Lubricators



CORRECT lubrication of pile hammers is essential to their continued efficiency and satisfactory operation. In any type of machine it is important to maintain a film of oil between moving surfaces, and in a pile hammer this is particularly necessary because of the high speed and severe service conditions.

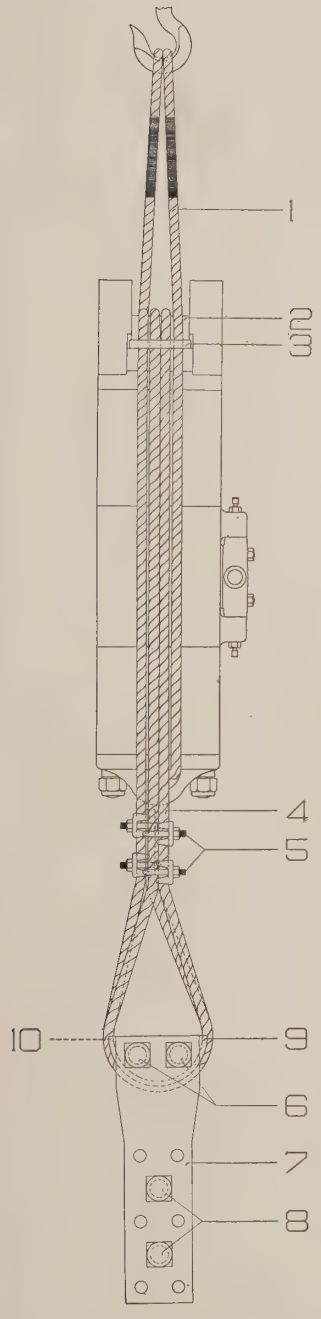
The No. 0 Hammer has an oil reservoir in the cylinder. The Nos. 1, 2 and 3 Hammers are furnished with oil cups for attachment to the inlet pipe at the valve chest.

The arrangement shown by the accompanying diagram has been found best adapted for the larger sizes of pile hammers. It consists of a drop feed cup which is connected to the steam or air line to the pile hammer. An atomizer introduces the oil into the center of the stream of steam or air. As the oil passes from the lubricator past the atomizer nozzle and into the bell end of the atomizer, the rapidly moving steam or air picks it off and breaks it up into very finely divided particles, which are carried along in suspension and deposited all over the internal

surfaces of the hammer in the form of a thin oil film.

These lubricators are used on the No. 5 and larger sizes of McKiernan-Terry Pile Hammers. The Type "B" Hammers have in addition oil pockets built in the top cylinder.

The lubricators can be placed at any point in the steam or air line to the hammer, but they should not be connected up next to the hammer, as the vibration would quickly destroy them. The most convenient location will generally be found to be at the connection between the hose line to the hammer and the pipe from the boiler or air compressor, or, if preferred, they can be at some point in the pipe line back of the hose.



How to equip Type B Pile Hammers for subaqueous driving

THE drawing at the right shows how to attach the air inlet hose which is needed for subaqueous pile driving with McKiernan-Terry Type B Hammers. No other special equipment is needed, excepting of course that the exhaust line must be carried above the surface.

About 60 cubic feet of compressed air per minute is sufficient volume for any Type B Hammer, and about ½-pound pressure is required for every foot of submergence.

Special rig for pile pulling

AT the left is shown the cable pulling rig recommended as preferable to more expensive rigid rigging for the average run of work.

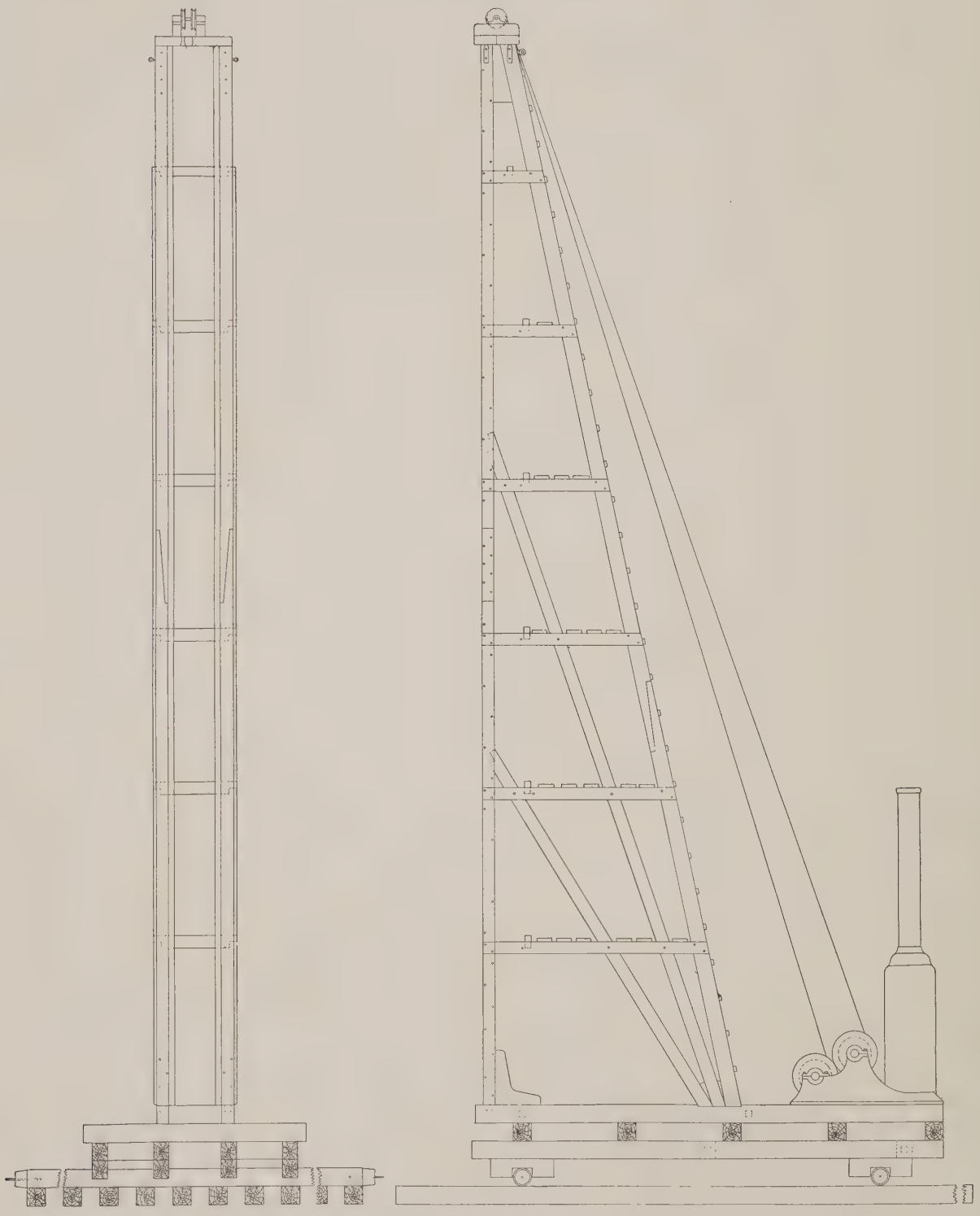
Parts for Pulling Rigs Nos. 5, 6 and 7 pile hammers.

Part No.	Name	No. Required	Code Word
1	Crane Sling	1	ADPAD
2	Grooved Saddle Block	1	ADPEB
3	Retaining Ring	1	ADPIF
4	Pile Sling	1	ADPOG
5	Clips	8	ADPUH
6	Pile Sling Bolt and Nut	2	ADRAE
7	Pile Clamp	2	ADRIG
8	Pile Bolt and Nut	2	ADROH
9	Half Sheave (single)	2	ADSAH
10	Half Sheave (double)	1	ADSEI

Note: When ordering parts be sure to specify whether for No. 5, 6 or 7 pile hammer.

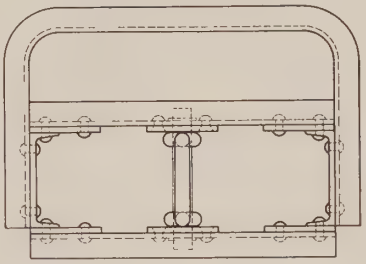
Parts No. 5, 9 and 10 not used on No. 5 pile hammer.

Pulling Rig, complete, for No. 5 Pile Hammer.....ORNOB
Pulling Rig, complete, for No. 6 Pile Hammer.....OROZU
Pulling Rig, complete, for No. 7 Pile Hammer.....ORRUF



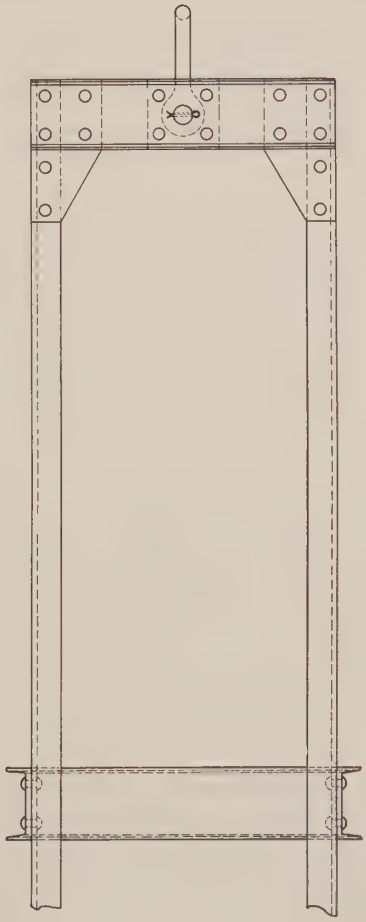
Pile hammer ways and leads

IN order to be of as much service as possible to customers, the McKiernan-Terry Corporation has prepared a complete set of pile driving ways suitable for use with Nos. 7, 9-B-2, 10-B-2 and 11-B-2 Pile Hammers. These ways were designed after careful study of the requirements and will appeal to anyone familiar with this kind of equipment.



While it is not our plan to build and sell complete pile driving ways, we are prepared to furnish the necessary irons, head blocks, sheaves, bolts, etc., so that by purchasing the timber, complete designs and specifications of which will be furnished, the contractor can build the ways on his job.

These ways have been designed in sizes from 40 to 70 feet, to fit McKiernan-Terry Nos. 7, 9-B-2, 10-B-2 and 11-B-2 Pile Hammers. Drawings showing the general design will be found on page 94 and prices on the iron fittings required will be furnished on application. Prospective purchasers should specify the height of ways required and the size of hammer to be used. Customers who order a set of irons, head block, sheaves, bolts, etc., will receive a complete set of detailed blue prints, showing the construction of the size of ways desired and a bill of material covering the necessary timber.



Steel hanging leads have also been designed, for use with McKiernan-Terry Pile Hammers. We are prepared to quote and make prompt shipment of hanging leads complete in any length, for use with McKiernan-Terry machines.

An illustration showing a general design of hanging leads is shown on this page. It is advisable to note in this connection that contractors whenever possible should use the ordinary fixed leads, as it is extremely difficult, even with hanging leads, to keep the hammer in a vertical position and at the same time allow its full weight to rest upon the pile. Considerable loss of efficiency in driving and possible damage to the hammer will result if the hammer does not rest squarely on the piling while driving.

We are also prepared to design and build special pile driving equipment for use on work for which the ordinary types of equipment are not adapted.

Formula for bearing power of piles

THE Engineering News formula which is given below is generally used by engineers to determine the bearing capacity of piles driven with McKiernan-Terry Pile Hammers. An example of its use is given in the following table.

$$L = \frac{2E}{S + .1} \qquad L = \frac{2 \times 8200}{S + .1}$$

In the above formula L equals the bearing capacity of piles in pounds. E equals energy or foot-pounds per blow. S equals average penetration in inches per blow for the last few blows.

The foregoing illustration is based on the No. 9-B-2 Pile Hammer running 140 strokes per minute and developing an 8200-foot-pound blow.

While no formula can be guaranteed to apply to all conditions, this one represents the best judgment of engineers who are specially qualified to speak authoritatively on the subject.

Attention is called to the fact that McKiernan-Terry Pile Hammers at the speeds indicated below must develop the foot pounds per blow as specified. Calculations based on steam pressure are misleading because no two set-ups are identical and it is impossible to determine the mean effective pressure in the working cylinder from the boiler pressure as shown by gauge.

Size of Hammer No.	Weight of Ram, Pounds	Lifting Area of Piston, Square Inches	Striking Area of Piston, Square Inches	Length of Stroke, Inches	Foot-Pounds Blow at Given Strokes per Minute	
					Strokes per Minute	Foot-Pounds per Blow
5	200	18.85	18.85	7	300 275 250	1,000 800 650
6	400	36.18	36.18	8¾	275 230 200	2,500 2,160 1,680
7	800	55.6	55.6	9½	225 195 170	4,150 3,720 3,280
9-B-2	1500	44.177	56.745	16	140 130 120	8,200 7,000 5,940
10-B-2	2500	65.97	78.54	20	115 108 100	15,000 12,500 10,700
11-B-2	3625	100.645	120.28	20	120 110 100	22,080 18,920 15,640

Bearing power of piles driven with McKiernan-Terry Pile Hammers

Using engineering news formula

$$L = \frac{2E}{S + .1}$$

The assumed safety factor of this formula is 6

Size of hammer and energy per blow

Penetration per Blow Inches	BEARING POWER IN POUNDS			
	No. 11-B-2 22,080 ft.-lb.	No. 10-B-2 15,000 ft.-lb.	No. 9-B-2 8200 ft.-lb.	No. 7 4150 ft.-lb.
.1	220,800	150,000	82,000	41,500
.2	147,200	100,000	54,666	27,666
.3	110,400	75,000	41,000	20,750
.4	88,320	60,000	32,800	16,600
.5	73,600	50,000	27,333	13,833
.6	63,085	42,857	23,428	11,857
.7	55,200	37,500	20,500	10,375
.8	49,066	33,333	18,222	9,222
.9	44,160	30,000	16,400	8,300
1.	40,145	27,272	14,909	7,545

To compute the factor "E" (energy in foot-pounds) (W + AP) H = foot-pounds or "E" wherein:

W = weight of ram in pounds (see second column in table page 96)

A = effective striking area of piston (see fourth column table page 96)

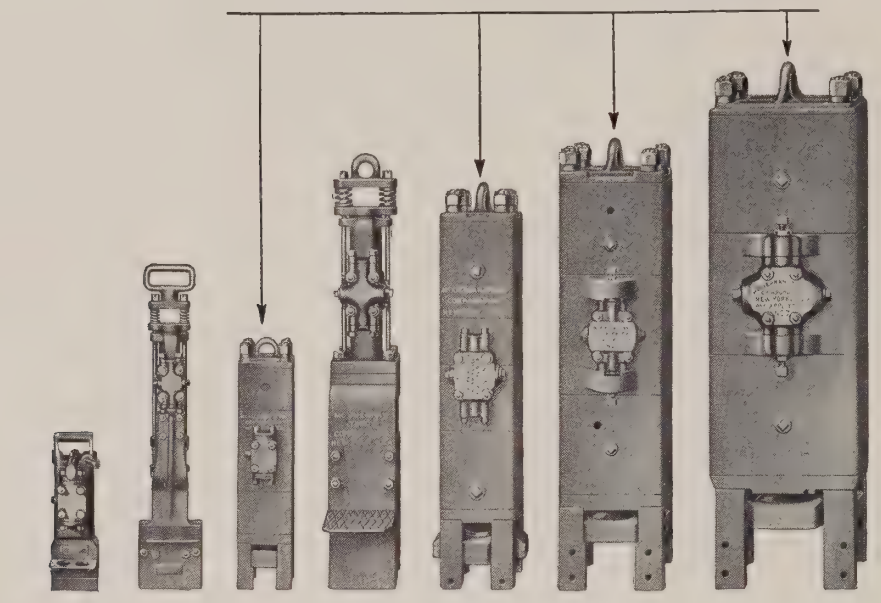
P = mean effective pressure of steam or air in hammer cylinder

H = stroke in feet (see fifth column in table page 96)

Factor P at normal stroke indicated in specification table equals approximately 85.

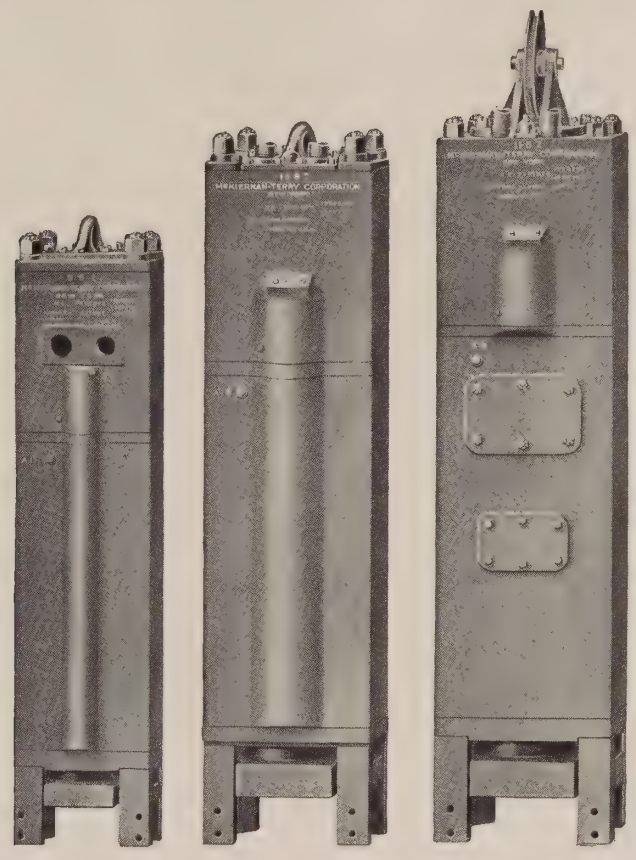
Specifications of McKiernan-Terry Pile Hammers

"DUBL-DUTY" DRIVERS AND PULLERS



Size of Hammer — No.	0	1	2	3	5
Net weight, pounds	95	145	343	675	1500
Shipping weight, pounds	125	185	380	735	1560
Cubic measurements, inches	8 x 12 x 24	9 x 11 x 47	11 x 10 x 37	14 x 13 x 62	19 x 14 x 57
Weight of ram, pounds	5¼	21	48	68	200
Bore, inches	2¼	2¼	4 1/16	3¼	7
Stroke, inches	4¾	3¾	5¼	5¾	7
Strokes per minute	*	*	*	*	300
Foot-pounds energy per blow	*	*	*	*	1000
Boiler h.p. required	5	10	10	15	20
Compressed air, actual cubic feet	45	75	85	90	200
Size of hose, inches	¾	¾	¾	1	1¼
Size wood sheeting or round piling, inches	†{2 x 10 / 3 x 8	†{2 x 10 / 3 x 10	3 x 8	3 x 12	4 x 12
Penetration in average material, feet	3–4	4–6	6–10	6–10	10–15
Size steel sheet piling, inches	9	9	9	12	12
Penetration in average material, feet	5–6	6–10	10–15	10–15	15–20
Code word for hammer	OREMO	OPLAS	OPLET	OPLIX	OPLUZ

DOUBLE-ACTING PILE HAMMERS



9-B-2 10-B-2 11-B-2

6	7	9-B-2	10-B-2	11-B-2
2900	5000	6760	10,000	13,185
2970	5075	6800	10,100	13,285
24 x 19 x 63	27 x 21 x 73	24 x 20 x 92	28 x 24 x 105	30 x 26 x 119
400	800	1500	2500	3625
9¾	12½	8½	10	12⅜
8¾	9½	16	20	20
275	225	140	115	120
2500	4150	8200	15,000	22,080
25	35	40	50	60
275	400	450	600	800
1¼	1½	1½	2	2
6 x 12	10 x 14	17	20	21
15–20	20–30	30–40	50–70	60–80
12	Largest	Largest	Largest	Largest
20–30	30–40	50–60	60–80	70–100
OPMAT	OPMEX	OPMOZ	OPMUL	OPNAX

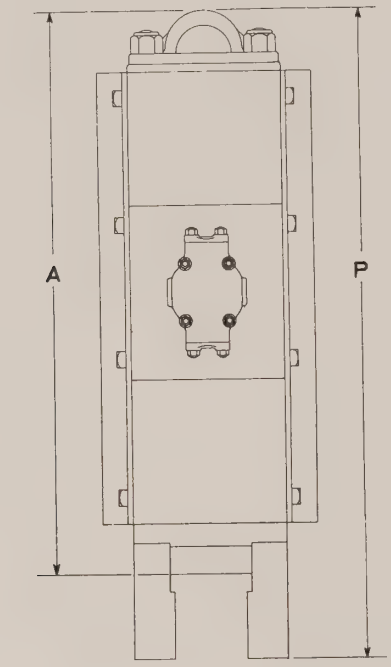
The strokes per minute shown here should not be exceeded.

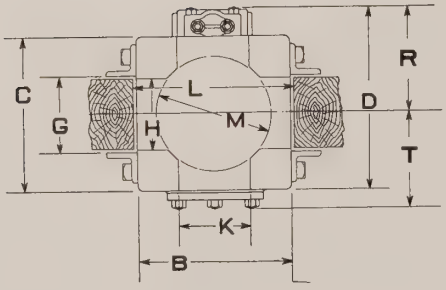
* Figures cannot be given, because of the high speed of these machines.

Note—When ordering hammer sizes Nos. 9-B-2, 10-B-2 or 11-B-2 specify whether flat or bell bottom anvil block is wanted. See pages 109, 110 and 111.

† If ordering No. 0 or No. 1 hammer specify size of sheeting.

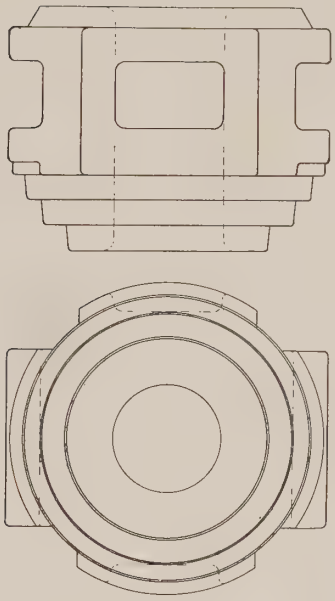
Exterior and base dimensions of pile hammers



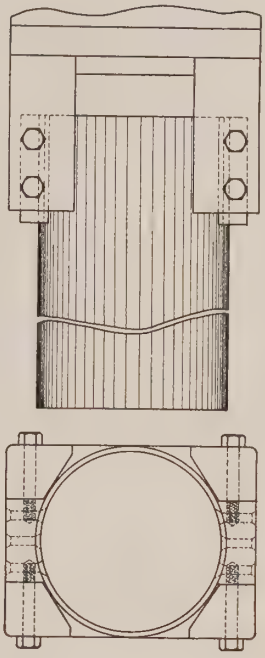


Size No.	A Inches	B Inches	C Inches	D Inches	G	H Inches	K Inches	L Inches	M Inches	P Inches	R Inches	T Inches
0	20	6	4	6½	....	2¼–3¼	....	..	....	23	4½	2
1	39	8	6	10½	....	2¼–3¼	....	..	....	43	4¼	1⅝
2	29	7½	6⅝	9	....	3⅛	3⅛	..	4⅜	33	5 11/16	3 5/16
3	53	9	9½	16½	....	3⅝	....	..	....	58	5⅜	2¾
5	51	11	11	14¾	....	4¼	4¼	12	6	57	9¼	5½
6	55	15	15	18	As Required	7	7	16	11¼	63	10½	7½
7	63	21	16	22⅝		7	11	22	16	73	14⅝	8¾
9-B-2	83	20	20	22		11	11	21	17½	91	11	12
10-B-2	96	24	24	26		14½	14½	25	22	105	14	14
11-B 2	111	26	26	28		16	16	27	23¾	119	15	15½

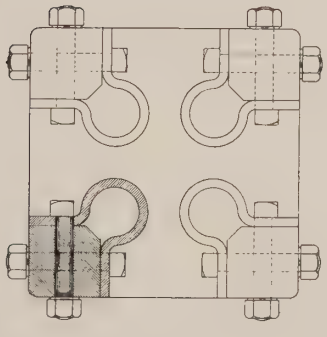
Typical base attachments



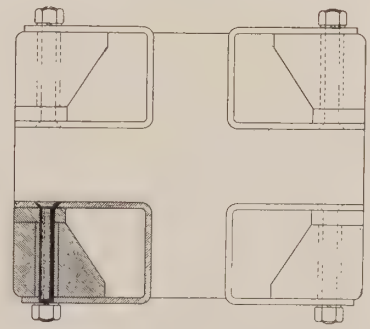
Pipe driving cap for the No. 6 Hammer. Sizes of pipe for No. 6—12-inch and 15-inch. Sizes for No. 7—12-inch, 14-inch, 15-inch and 16-inch pipe. Sizes for 9-B-2—10-inch, 12-inch and 15-inch pipe. Also for 12-inch, 16-inch and 18-inch pipe.



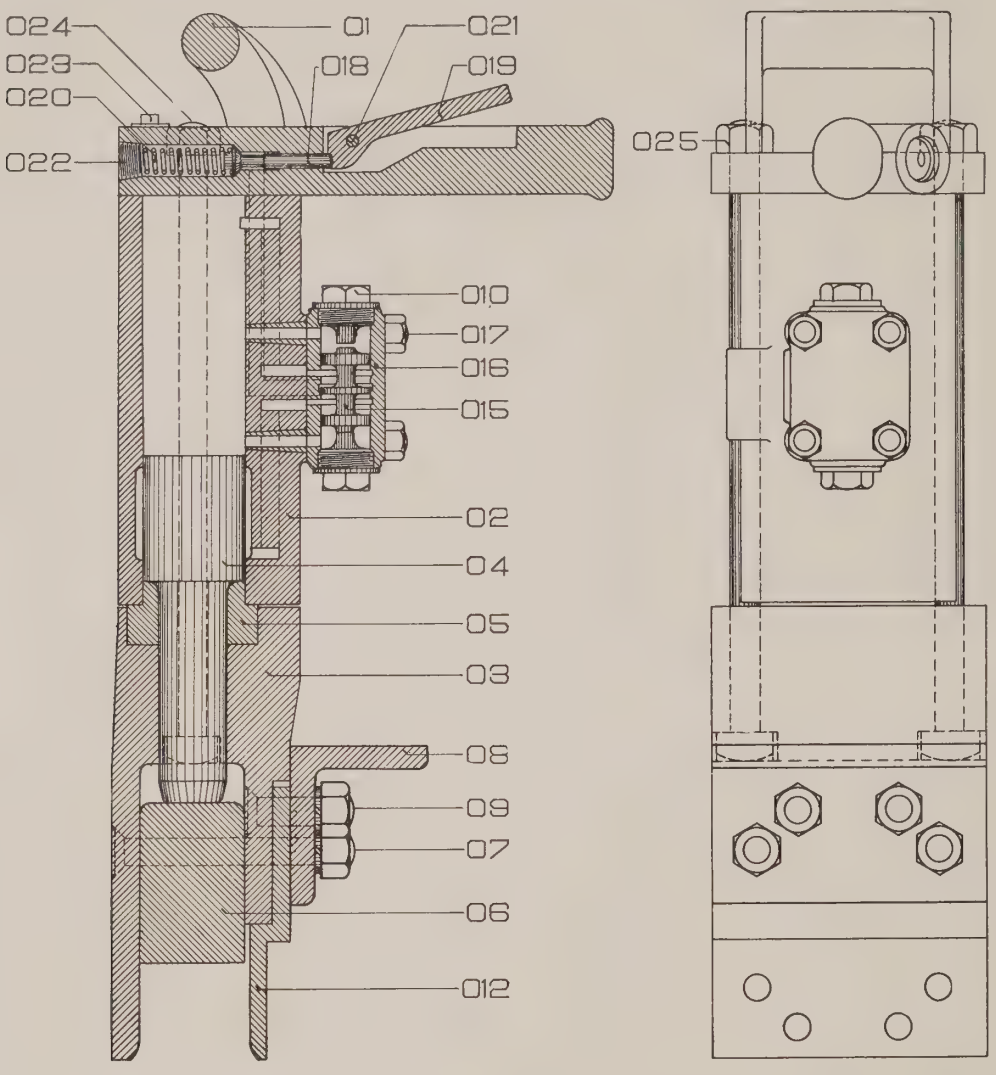
A section of pipe bolted to the lugs of the hammer to serve as a guide when driving round piling. By this method the hammer, suspended from a derrick line, can be allowed to bear full weight upon the pile and, with a slack line, be always in alignment with it. Can be applied to No. 6 and larger hammers. Size of pipe to be determined by dimension M on page 100.



Filling pieces for No. 5 and No. 6 Pile Hammers for use with various sizes and sections of steel sheet piling.



Filling pieces used with No. 7 Pile Hammer for driving 14-inch arch-web piling or Wakefield sheet piling.



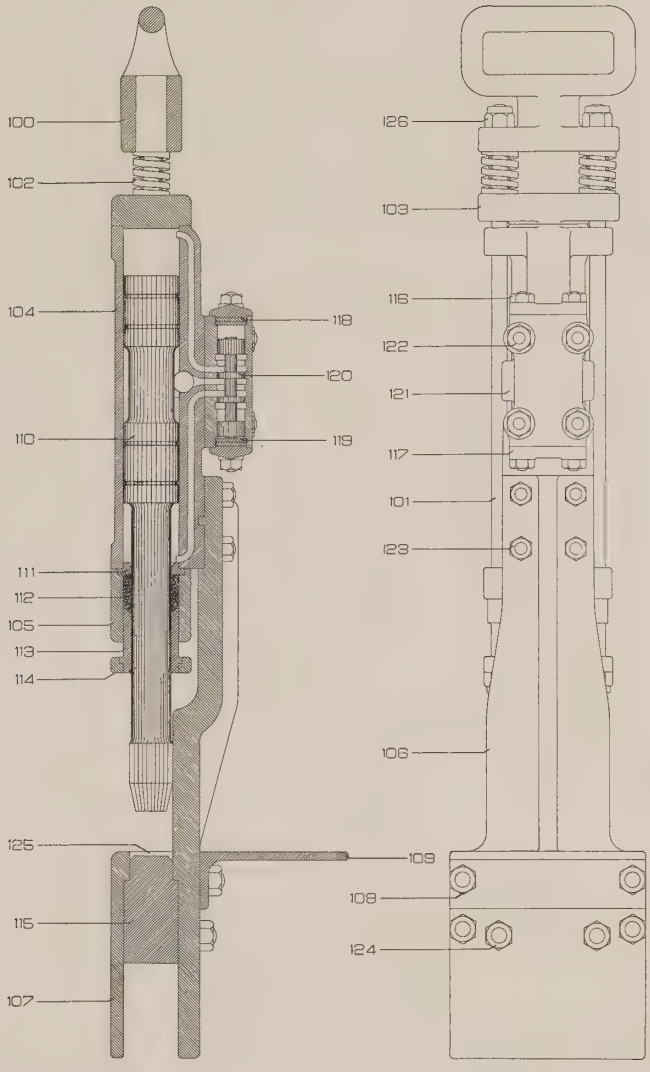
Duplicate Parts for No. 0 Pile Hammer

No. 0 Pile Hammer, Code Word, OREMO

No.	Name	Code Word	No.	Name	Code Word
01	Top head	ADUFE	015	Valve	ADVOW
02	Cylinder	ADUGI	016	Valve Chest	ADVUE
03	Base Block	ADUHO	017	Chest Stud and Nut	ADWAL
04	Ram	ADUKU	018	Inlet Valve	ADWEM
05	Piston Bearing	ADULY	019	Inlet Valve Handle	ADWIN
06	Anvil Block	ADUMS	020	Inlet Valve Spring	ADWOK
07	Anvil Block Guide Bolt and Nut	ADUNT	021	Inlet Valve Handle Pin	ADWUP
08	Step	ADURP	022	Spring Stop	ADXAM
09	Base Block Bolt and Nut	ADVAV	023	Oil Plug	ADXEN
010	Chest Cover	ADVEH	024	Side Rod	ADXIC
012	Base Block Cap*	ADVIO	025	Side Rod Nut	ADXIM

Parts for the Pavement Breaker Attachment are listed in a special Bulletin which will be sent on request.

* Reversible for 2-inch or 3-inch wood sheeting.

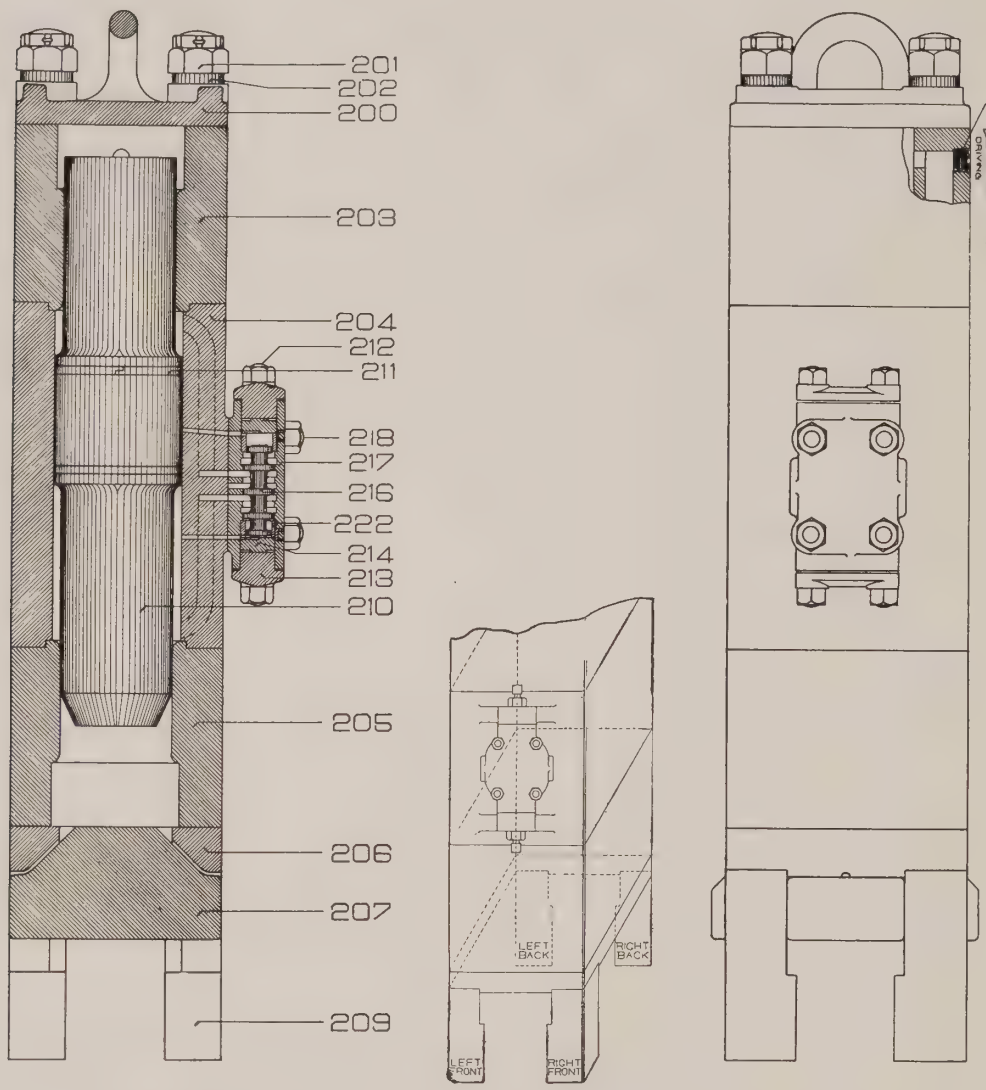


Duplicate Parts for No. 1 Pile Hammer

No. 1 Pile Hammer, Code Word, OPLAS

No.	Name	Code Word	No.	Name	Code Word
100	Bail	ABFAF	114	Packing Sleeve Gland	ABHUY
101	Side Rod	ABFEP	115	Anvil Block	ABIGT
102	Top Head Spring	ABFIR	116	Chest Cover Stud and Nut	ABIHZ
103	Top Head	ABFOS	117	Chest Cover	ABILS
104	Cylinder	ABFUT	118	Valve Buffer	ABINA
105	Bottom Head	ABGAP	119	Valve Washer	ABIPE
106	Base Block	ABGER	120	Valve	ABIRI
107	Base Block Cap*	ABGIS	121	Valve Chest	ABISO
108	Base Block Bolt and Nut	ABGOT	122	Chest Stud and Nut	ABITU
109	Step	ABGUX	123	Cylinder Stud and Nut	ABIVY
110	Ram	ABHAR	124	Anvil Block Guide Bolt and Nut	ABJAS
111	Bottom Head Split Ring	ABHES	125	Base Block Distance Piece	ABJET
112	Piston Rod Packing	ABHIT	126	Side Rod Nut (2)	ABJIX
113	Packing Sleeve	ABHOX			

* Can be supplied for either 2-inch or 3-inch sheeting.

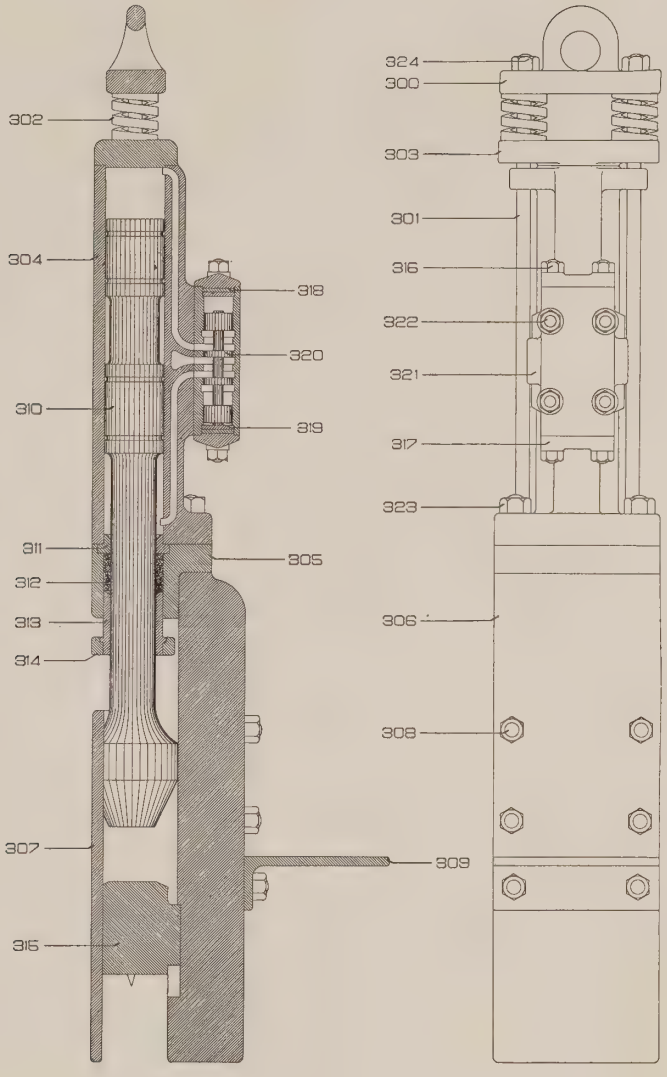


Duplicate Parts for No. 2 Pile Hammer

No. 2 Pile Hammer, Code Word, OPLET

No.	Name	Code Word	No.	Name	Code Word
200	Top Head	ABMAY	212	Chest Cover Stud and Nut	ABOCY
201	Tie Rod Nut	ABMEZ	213	Chest Cover	ABOGN
202	Tie Rod Washer	ABMIA	214	Valve Washer	ABOHF
203	Top Cylinder	ABMOB	216	Valve	ABOSP
204	Middle Cylinder	ABMUC	217	Valve Chest	ABOTZ
205	Bottom Cylinder	ABNAZ	218	Chest Stud and Nut	ABOVA
206	Bottom Head	ABNEG	219	Pulling Plug	ABOWE
207	Anvil Block	ABNIB	220	Driving Plug	ABOXI
209	Tie Rod (right and left)	ABNOC	222	Valve Bushing (2 pieces)	ABPAB
210	Ram	ABNUD	223	Lifting Handles	ABPEC
211	Piston Ring	ABOBU			

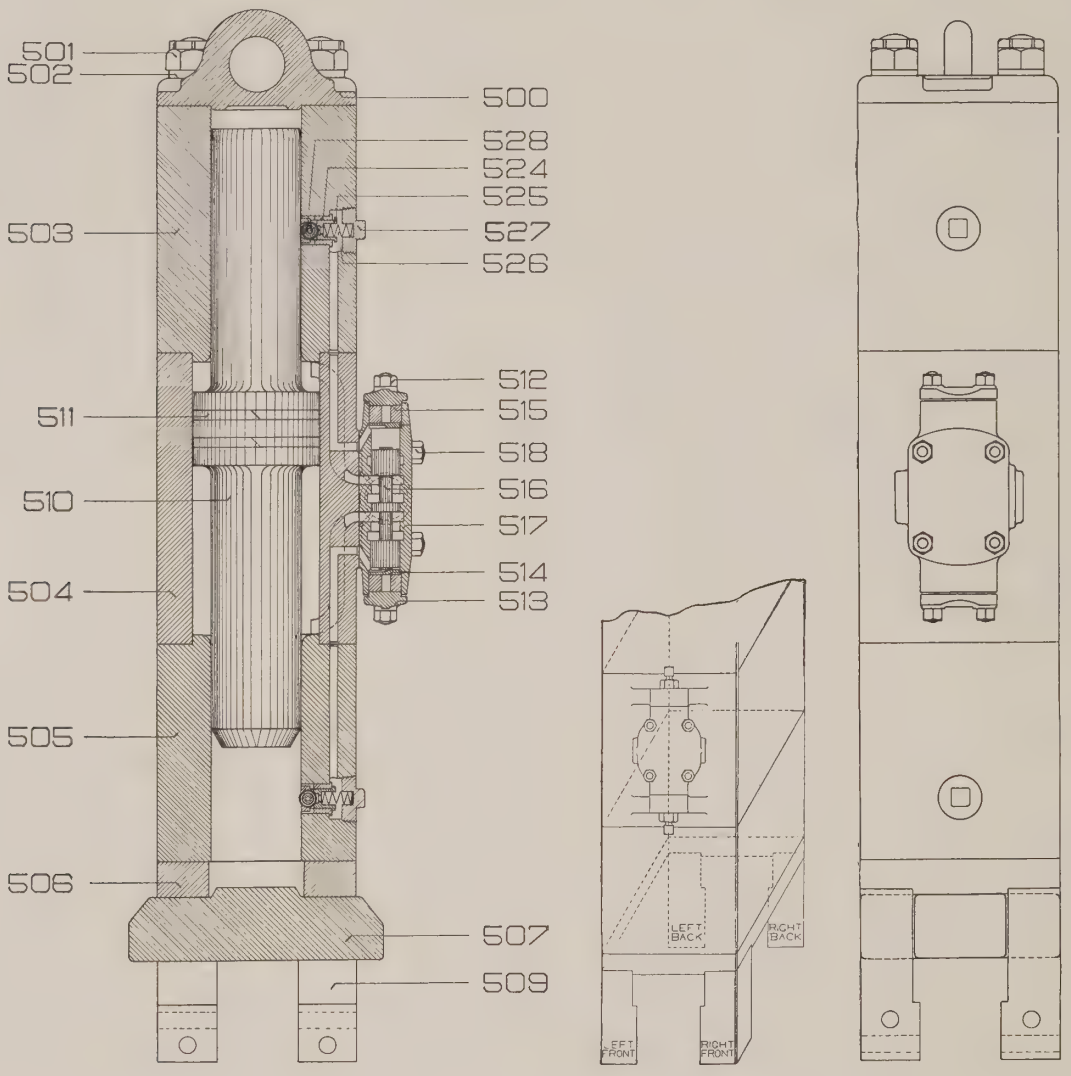
NOTE: When ordering tie rods (Part No. 209) be sure to specify whether right or left side, front or back (looking toward valve chest). See diagram above.



Duplicate Parts for No. 3 Pile Hammer

No. 3 Pile Hammer, Code Word, OPLIX

No.	Name	Code Word	No.	Name	Code Word
300	Bail	ABTAE	313	Packing Sleeve	ABUZN
301	Side Rod	ABTEF	314	Packing Sleeve Gland	ABVAH
302	Top Head Spring	ABTIG	315	Anvil Block	ABVEI
303	Top Head	ABTOH	316	Chest Cover Stud and Nut	ABVIK
304	Cylinder	ABUBA	317	Chest Cover	ABVOL
305	Bottom Head	ABUCE	318	Valve Buffer	ABWAG
306	Base Block	ABUDI	319	Valve Washer	ABWEK
307	Base Block Cap	ABUFO	320	Valve	ABWIL
308	Base Block Bolt and Nut	ABUGU	321	Valve Chest	ABXAK
309	Step	ABUHY	322	Chest Stud and Nut	ABXEL
310	Ram	ABULT	323	Cylinder Stud and Nut	ABXIM
311	Bottom Head Split Ring	ABUMP	324	Side Rod Nut (2)	ABXON
312	Piston Rod Packing	ABUSK			

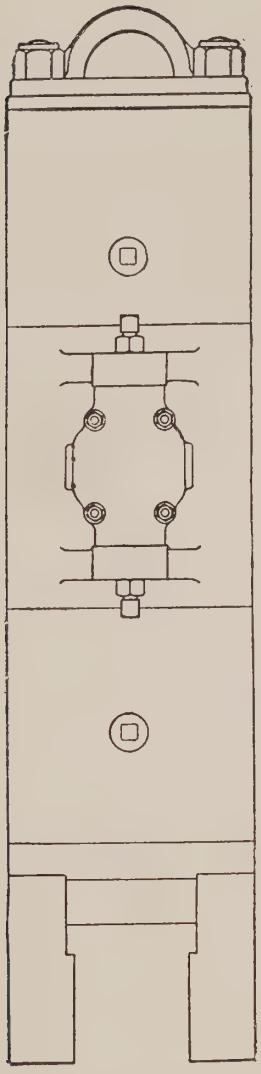


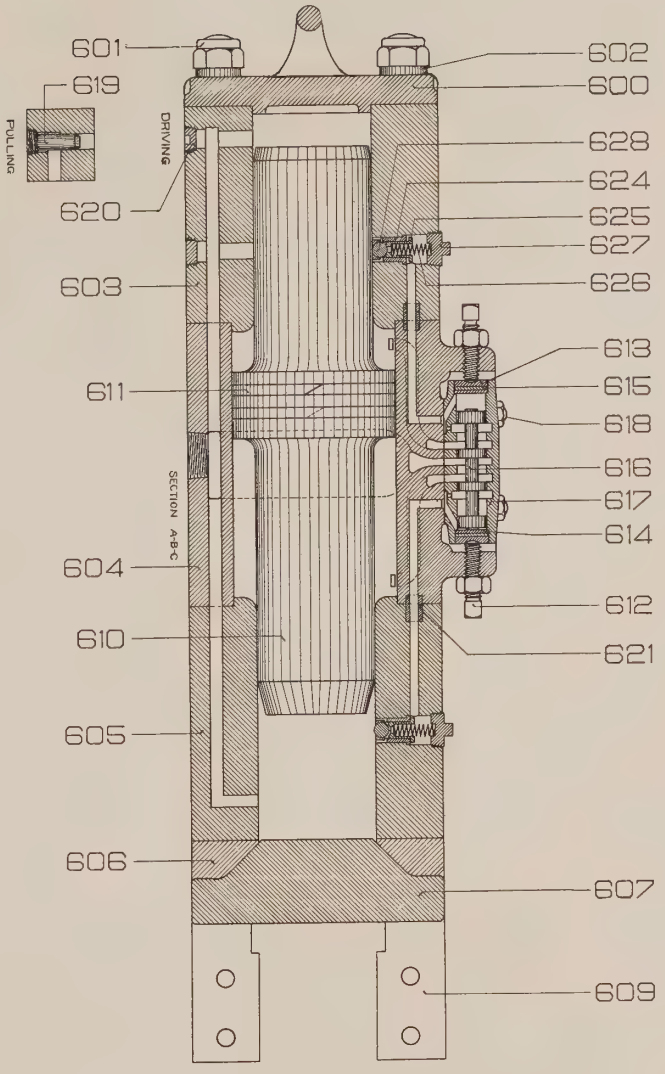
Duplicate Parts for No. 5 Pile Hammer

No. 5 Pile Hammer, Code Word, OPLUZ

No.	Name	Code Word	No.	Name	Code Word
500	Top Head	ACABT	513	Chest Cover	ACBUK
501	Tie Rod Nut	ACACS	514	Valve Washer	ACCAN
502	Tie Rod Washer	ACAFZ	515	Valve Buffer	ACCEO
503	Top Cylinder	ACAGA	516	Valve	ACCIP
504	Middle Cylinder	ACAKI	517	Valve Chest	ACCOR
505	Bottom Cylinder	ACALO	518	Chest Stud and Nut	ACCUS
506	Bottom Head	ACANY	524	Valve Cage	ACDAF
507	Anvil Block	ACARB	525	Movable Valve Seat	ACDEP
509	Tie Rod (right and left)	ACBAM	526	Spring	ACDIR
510	Ram	ACBEN	527	Spring Stop	ACDOS
511	Piston Ring	ACBIC	528	Steel Ball	ACDUT
512	Chest Cover Stud and Nut	ACBOP			

NOTE: When ordering Tie Rods (Part No. 509) be sure to specify whether right or left side, front or back (looking toward valve chest). See diagram above.

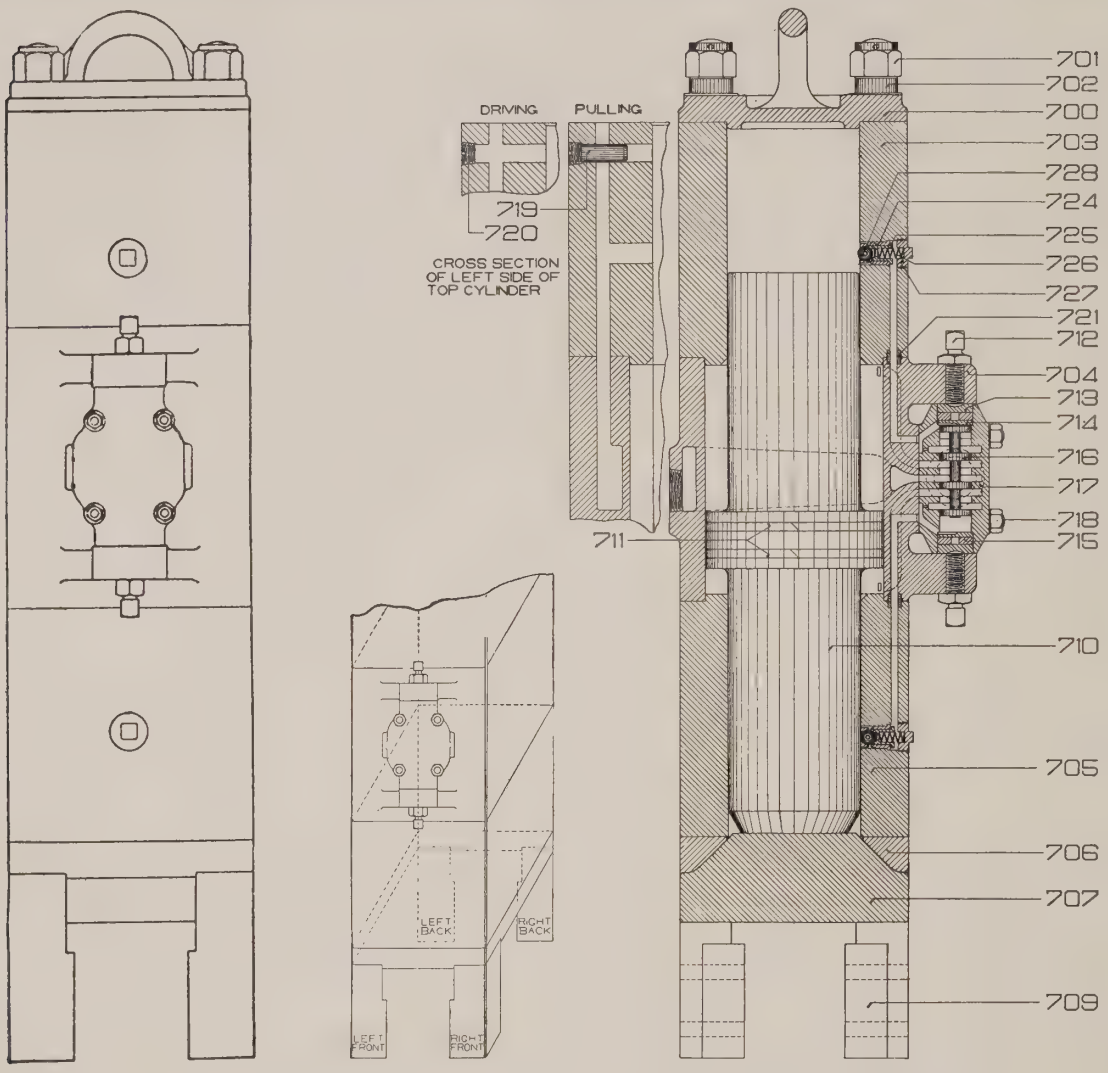




Duplicate Parts for No. 6 Pile Hammer

No. 6 Pile Hammer, Code Word, OPMAT

No.	Name	Code Word	No.	Name	Code Word
600	Top Head	ACFAP	614	Valve Washer	ACHUZ
601	Tie Rod Nut	ACFER	615	Valve Buffer	ACICK
602	Tie Rod Washer	ACFIS	616	Valve	ACIDZ
603	Top Cylinder	ACFOT	617	Valve Chest	ACIFT
604	Middle Cylinder	ACFUX	618	Chest Stud and Nut	ACIPA
605	Bottom Cylinder	ACGAR	619	Pulling Plug	ACIRE
606	Bottom Head	ACGES	620	Driving Plug	ACISI
607	Anvil Block	ACGIT	621	Dowel	ACITO
609	Tie Rod (interchangeable)	ACGOX	624	Valve Cage	ACIWY
610	Ram	ACHAS	625	Movable Valve Seat	ACIXS
611	Piston Ring	ACHET	626	Spring	ACJAT
612	Chest Cover Set Screw and Nut	ACHIX	627	Spring Stop	ACJEX
613	Chest Cover	ACHOY	628	Steel Ball	ACJIH

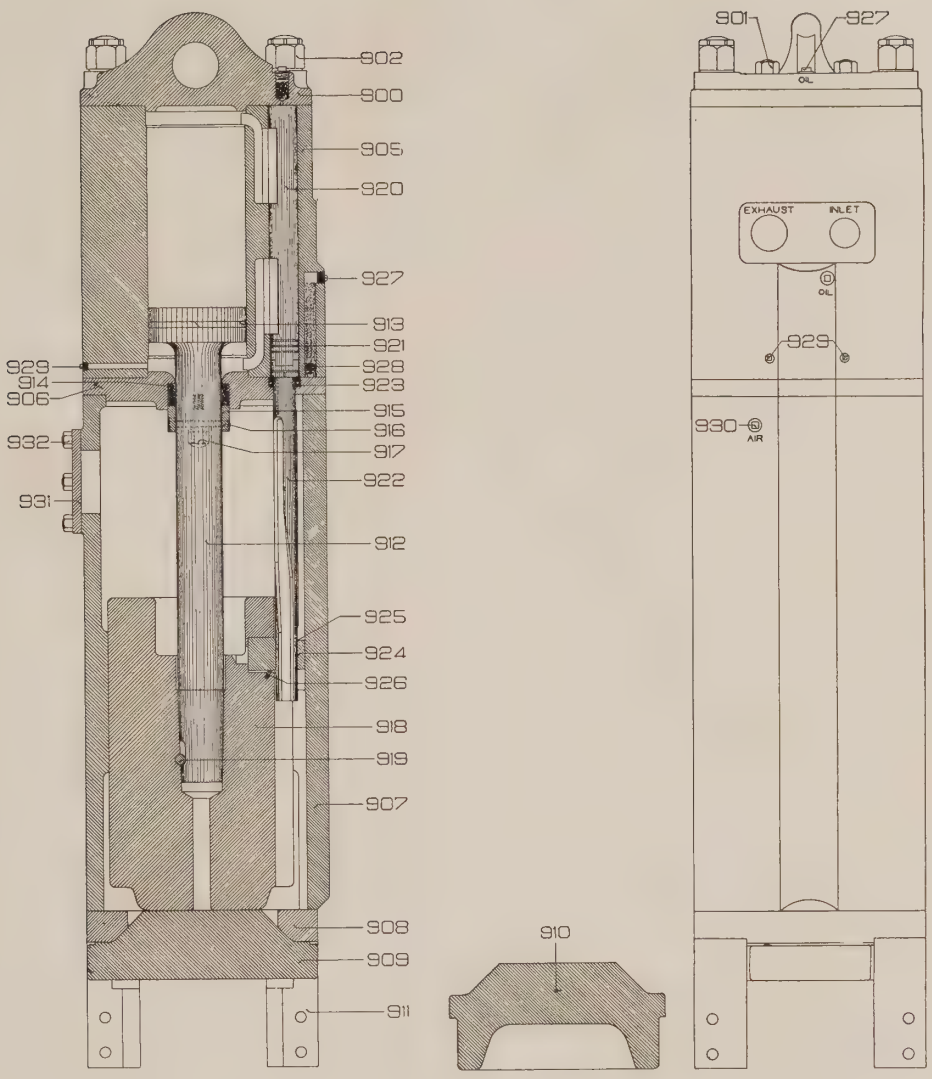


Duplicate Parts for No. 7 Pile Hammer

No. 7 Pile Hammer, Code Word, OPMEX

No.	Name	Code Word	No.	Name	Code Word
700	Top Head	ACLEZ	714	Valve Washer	ACOBO
701	Tie Rod Nut	ACLIA	715	Valve Buffer	ACOCU
702	Tie Rod Washer	ACLOB	716	Valve	ACODY
703	Top Cylinder	ACLUC	717	Valve Chest	ACOKS
704	Middle Cylinder	ACMAZ	718	Chest Stud and Nut	ACOLM
705	Bottom Cylinder	ACMEG	719	Pulling Plug	ACOPH
706	Bottom Head	ACMIB	720	Driving Plug	ACORF
707	Anvil Block (flat)	ACMOC	721	Dowel	ACOST
708	Anvil Block (bell bottom)	ACMUD	724	Valve Cage	ACOWA
709	Tie Rod (right and left)	ACNAB	725	Movable Valve Seat	ACOXE
710	Ram	ACNEC	726	Spring	ACOZI
711	Piston Ring	ACNID	727	Spring Stop	ACPED
712	Chest Cover Set Screw and Nut	ACNOE	728	Steel Ball	ACPIE
713	Chest Cover	ACNUF			

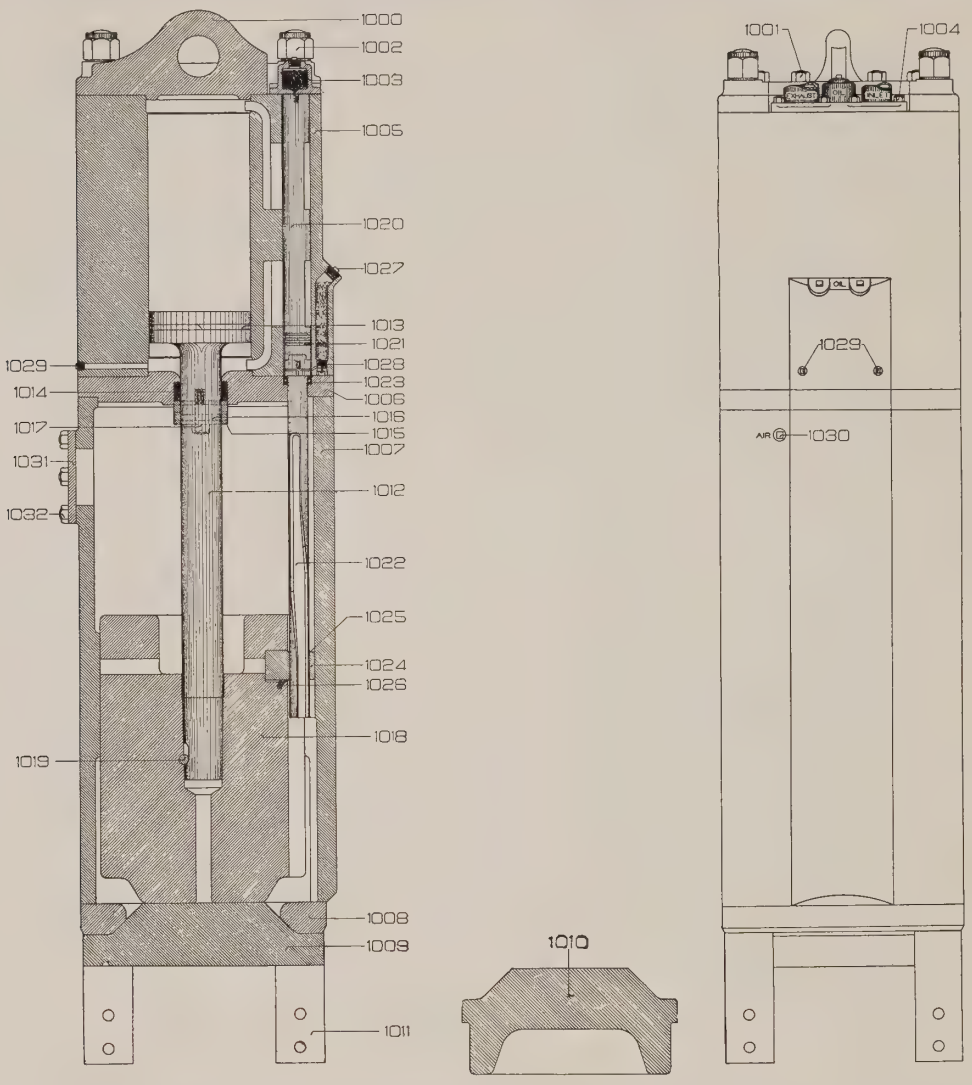
NOTE: When ordering Tie Rods (Part No. 709) be sure to specify whether right or left side, front or back (looking toward valve chest). See diagram above.



Duplicate Parts for No. 9-B-2 Pile Hammer

No. 9-B-2 Pile Hammer, Code Word, OPMOZ

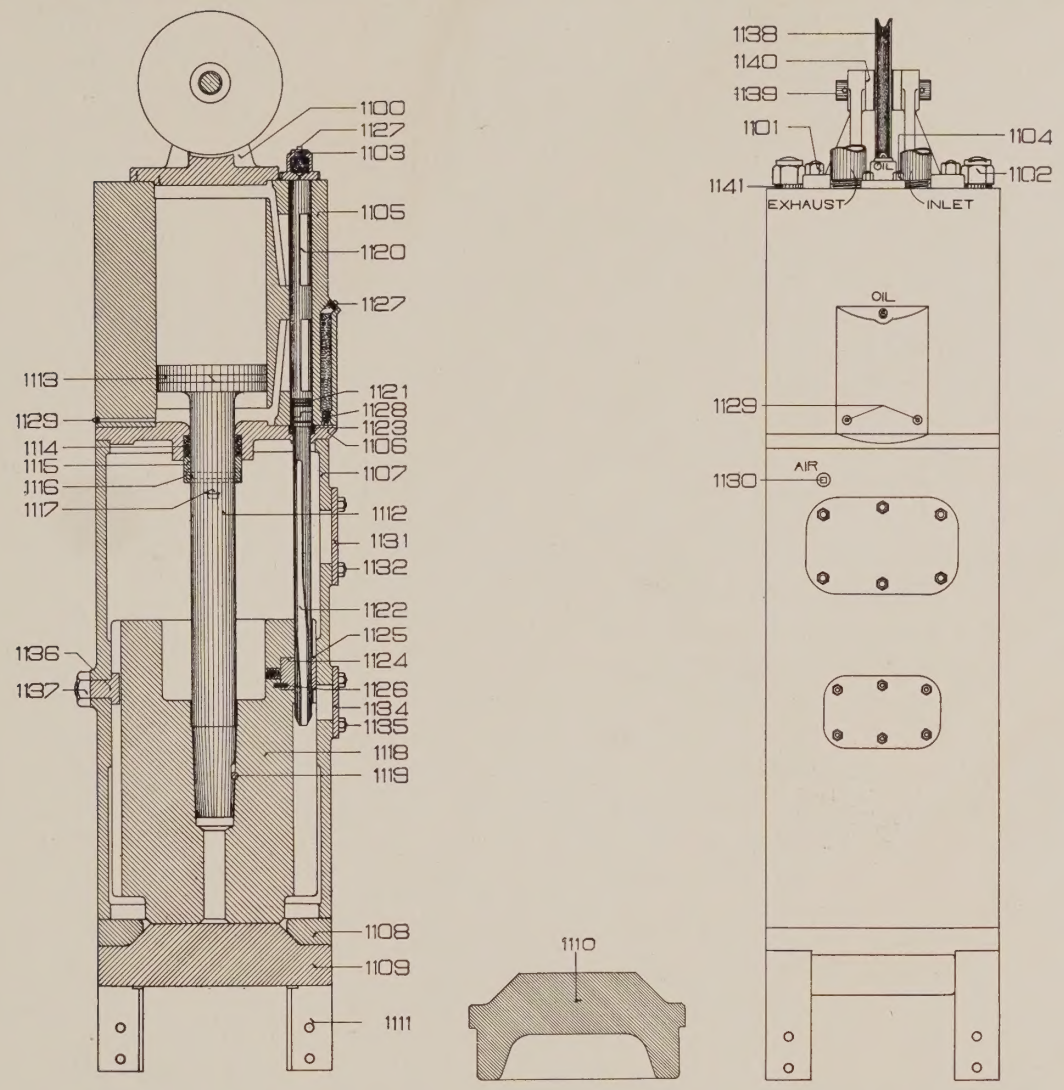
No.	Name	Code Word	No.	Name	Code Word
900	Top Head	ACSAE	918	Ram	ACUMB
901	Top Head Stud and Nut	ACSEF	919	Ram Taper Pin	ACURS
902	Tie Rod Nut	ACSIG	920	Valve	ACVAG
905	Top Cylinder	ACSOH	921	Valve Ring	ACVEK
906	Intermediate Head	ACSUS	922	Cam Rod	ACVIL
907	Bottom Cylinder	ACTAH	923	Cam Rod Bearing	ACVOM
908	Bottom Head	ACTEI	924	Cam Throw	ACVUN
909	Anvil Block (flat)	ACTIK	925	Cam Throw Locking Screw	ACWAK
910	Anvil Block (bell bottom)	ACTOL	926	Cam Throw Key	ACWEL
911	Tie Rod (interchangeable)	ACUCA	927	Oil Plug	ACWIM
912	Piston	ACUDE	928	Oil Pocket Cap	ACWON
913	Piston Ring	ACUFI	929	Drain Plug	ACXAV
914	Piston Rod Packing	ACUGO	930	Air Inlet Plug	ACXEH
915	Split Gland	ACUHM	931	Hand Hole Cover	ACXIO
916	Gland Cap Screw and Nut	ACUKY	932	Hand Hole Cover Stud and Nut	ACXOW
917	Gland Stud and Nut	ACULZ	933	Dowel	ACXUE



Duplicate Parts for No. 10-B-2 Pile Hammer

No. 10-B-2 Pile Hammer, Code Word, OPMUL

No.	Name	Code Word	No.	Name	Code Word
1000	Top Head	ADABS	1017	Gland Stud and Nut	ADCIR
1001	Top Head Stud and Nut	ADAFT	1018	Ram	ADCOS
1002	Tie Rod Nut	ADAHA	1019	Ram Taper Pin	ADCUT
1003	Valve Cover	ADAKE	1020	Valve	ADDAP
1004	Valve Cover Stud and Nut	ADALI	1021	Valve Ring	ADDIS
1005	Top Cylinder	ADAMO	1022	Cam Rod	ADDOT
1006	Intermediate Head	ADANG	1023	Cam Rod Bearing	ADDUX
1007	Bottom Cylinder	ADAPY	1024	Cam Throw	ADEHT
1008	Bottom Head	ADARC	1025	Cam Throw Locking Screw	ADELF
1009	Anvil Block (flat)	ADATS	1026	Cam Throw Key	ADEMA
1010	Anvil Block (bell bottom)	ADBAN	1027	Oil Plug	ADENE
1011	Tie Rod (interchangeable)	ADBEO	1028	Oil Pocket Cap	ADEPI
1012	Piston	ADBIP	1029	Drain Plug	ADERO
1013	Piston Ring	ADBOR	1030	Air Inlet Plug	ADESU
1014	Piston Rod Packing	ADBUS	1031	Hand Hole Cover	ADETY
1015	Split Gland	ADCAF	1032	Hand Hole Cover Stud and Nut	ADFAR
1016	Gland Cap Screw and Nut	ADCEP	1033	Dowel	ADFES



Duplicate Parts for No. 11-B-2 Pile Hammer

No. 11-B-2 Pile Hammer, Code Word, OPNAX

No.	Name	Code Word	No.	Name	Code Word
1100	Top Head	ADHAT	1121	Valve Ring	ADKIA
1101	Top Head Stud and Nut	ADHEX	1122	Cam Rod	ADKOB
1102	Tie Rod Nut	ADHIH	1123	Cam Rod Bearing	ADKUC
1103	Valve Cover	ADHOZ	1124	Cam Throw	ADLAZ
1104	Valve Cover Stud and Nut	ADHUL	1125	Cam Throw Locking Screw	ADLEG
1105	Top Cylinder	ADIBP	1126	Cam Throw Key	ADLIB
1106	Intermediate Head	ADICH	1127	Oil Plug	ADLOC
1107	Bottom Cylinder	ADIDT	1128	Oil Pocket Cap	ADLUB
1108	Bottom Head	ADIND	1129	Drain Plug	ADMAB
1109	Anvil Block (flat)	ADIRA	1130	Air Inlet Plug	ADMEC
1110	Anvil Block (bell bottom)	ADISE	1131	Upper Hand Hole Cover	ADMID
1111	Tie Rod (interchangeable)	ADITI	1132	Upper Hand Hole Cover Stud and Nut	ADMOE
1112	Piston	ADIVO	1133	Dowel	ADMUF
1113	Piston Ring	ADIXY	1134	Lower Hand Hole Cover	ADNAC
1114	Piston Rod Packing	ADJAX	1135	Lower Hand Hole Cover Stud and Nut	ADNED
1115	Split Gland	ADJEY	1136	Ram Guide	ADNIE
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McKiernan-Terry Corporation

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